

EXHIBIT 42
[FILED UNDER SEAL]

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IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
SHERMAN DIVISION

THE STATE OF TEXAS, et)
al.,)
)
Plaintiffs,)
)
v.)
) CASE NO.
GOOGLE, LLC,) 4:20-CV-00957-
) SDJ
Defendant.)

VIDEOTAPED DEPOSITION OF:
ANIL BUNTWAL SOMAYAJI, PHD
Taken on behalf of the Defendant
October 30, 2024

"MARKED HIGHLY CONFIDENTIAL"

Job No. CS6919006

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<p style="text-align: right;">Page 6</p> <p>1 THE VIDEOGRAPHER: Good morning. We 2 are going on the record at 9:35 a.m. on 3 October 30th, 2024. Please note that the 4 microphones are sensitive and may pick up 5 whispering and private conversations. Please 6 mute your phones at this time. Audio and video 7 recording will continue to take place unless all 8 parties agree to go off the record. 9 This is Media Unit One of the 10 video-recorded deposition of Anil Somayaji taken 11 by counsel for the defendants in the matter of 12 the State of Texas versus Google LLC, filed in 13 the United States District Court for the Eastern 14 District of Texas, Sherman Division. Civil 15 action Number 420 CV 00957 SDJ. 16 The location of this deposition is 17 the Veritext office at 1 Vantage Way, Nashville, 18 Tennessee. I'm Stephanie Freeman, the 19 videographer representing the Veritext. The 20 court reporter is Jennifer Haynie, also 21 representing Veritext. 22 Counsel, please state your 23 appearance for the record, followed by the 24 swearing in of the witness from the court 25 reporter.</p>	<p style="text-align: right;">Page 8</p> <p>1 Q. Thank you. And you are aware that this 2 deposition is being taken in Texas. Google LLC, 3 a civil action pending in the U.S. District 4 Court for the Eastern District of Texas? 5 A. Yes. 6 Q. So if I say this matter or this action 7 today, I'm referring to that case, the case in 8 which you submitted a report, okay? 9 A. Yes. 10 Q. And you understand you're testifying 11 under oath today? 12 A. Yes. 13 Q. Which mean you're require to tell the 14 truth? 15 A. Yes. 16 Q. Is there anything that would prevent you 17 from giving truthful answers to my questions 18 today? 19 A. No. 20 Q. You're not experiencing any unusual 21 stress or physical or mental condition? 22 A. No. 23 Q. Are you on any medication or under the 24 influence of any substances that would impact 25 your ability to respond truthfully and</p>
<p style="text-align: right;">Page 7</p> <p>1 MR. STEINTHAL: Russell Steintal 2 Axinn Veltrop & Harkrider LLP for Google -- 3 defendant Google LLC. 4 MR. HUNSBERGER: Axinn Veltrop & 5 Harkrider for the defendant Google LLC. 6 MS. SINGH: Darpan Singh for Axinn 7 Veltrop & Harkrider for defendant Google LLC. 8 MR. HILLEGAS: Peter Hillegas of 9 Norton Rose Fulbright representing the State of 10 Texas. With me are my co-counsels Jiang Wu also 11 of Norton Rose Fulbright and Jonathan Wilkerson 12 of the Lanier Law Firm. 13 14 ANIL BUNTWAL SOMAYAJI, PHD, 15 Having been sworn to tell the truth, 16 the whole truth and nothing but the 17 truth, testified as follows: 18 19 DIRECT EXAMINATION 20 BY MR. STEINTHAL: 21 Q. Good morning, Professor. Can you please 22 state your name for the record? 23 A. My full legal name is Anil Somayaji. 24 Q. And can you your last name for the court 25 reporter? 26 A. S-O-M-A-Y-A-J-I.</p>	<p style="text-align: right;">Page 9</p> <p>1 accurately today? 2 A. No. 3 Q. Okay. The court reporter will transcribe 4 everything we say. I will therefore try to wait 5 until you're done answering a question before I 6 ask the next one, and I'd ask that you do the 7 same while I'm asking a question. Does that 8 make sense? 9 A. Yes. 10 Q. Okay. To allow the reporter to take an 11 accurate record, it's important to give oral 12 answers to questions, so no head nods or 13 uh-huhs. Just try to be clear orally for the 14 record. Does that make sense? 15 A. Yes. 16 Q. If you don't understand any of my 17 questions, please feel free to ask me to 18 rephrase or repeat the question. If you do 19 answer my -- well -- 20 A. Okay. 21 Q. Yeah. And if you do answer my question, 22 I'm going to assume you understood it; does that 23 make sense? 24 A. Yes. 25 Q. Okay. If you need a break at any point,</p>

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<p style="text-align: right;">Page 10</p> <p>1 just let me know, and I'll try to find a good 2 stopping point. My only request is that 3 we finish -- you answer the questions pending 4 before we take a break; does that make sense? 5 A. Okay. 6 Q. Otherwise, we'll aim for a break about 7 every hour or so, but I'm sure the lawyers will 8 keep an eye on that for me. 9 Okay. Can I have the report? 10 (Exhibit Number 1 was marked.) 11 BY MR. STEINTHAL: 12 Q. So I'm handing you -- 13 A. This is a copy of my report I have a copy 14 here. 15 Q. Yeah. As long as there's no writing in 16 it, there's -- 17 A. There's no marks. 18 Q. That's fine if you want to look at that 19 one because I think we actually have to hand you 20 this one that has a sticker on it because she's 21 going to keep it, unless you want that. 22 So I'm handing you a copy of the report 23 that we're marking the record as Somayaji 24 Exhibit Number 1. This is copy of the report 25 that you served in the matter on September 9th,</p>	<p style="text-align: right;">Page 12</p> <p>1 in your report that you do not believe is 2 correct or you would not be willing to testify 3 to under oath? 4 A. There are two corrections I would like to 5 enter. 6 Q. Sure. 7 A. One is at the end of my CV, it mentions 8 my expert testimony in Epic Games versus Google 9 and Epic Games versus Apple. I did not do a 10 deposition in either case. I did reports and I 11 did trial testimony. 12 Q. Strike the word deposition from those, 13 okay. 14 A. Thank you. The other is that in the -- 15 in the materials considered, there's not a full 16 listing of the 11 source code snap shots, and 17 those should all be included in the materials 18 considered. 19 Q. And if that were corrected, it would list 20 all the ones we made available to you? 21 A. Exactly. 22 Q. Okay. Thank you. 23 So with those -- that was a correction to 24 appendix B, materials considered, correct? 25 A. Yes. Considered, yes.</p>
<p style="text-align: right;">Page 11</p> <p>1 2024. Just stick a sticker on the front of 2 that. 3 I assume you recognize this? 4 A. I do. 5 Q. This is a copy of the report you served 6 on September 9th, 2024? 7 A. It is. 8 Q. So you keep a copy -- you have a copy 9 there for reference during the matter. 10 This report contains all your opinions in 11 this matter, correct? 12 A. Yes. 13 Q. And just for the avoidance of doubt, 14 although this is marked a rebuttal report, you 15 did not submit an opening report in this case, 16 correct? 17 A. I did not. 18 Q. So this is the only one you submitted? 19 A. Yes. 20 Q. And did you submit any errata to your 21 report; is that correct? 22 A. I have not served an errata; however, I 23 do have a couple of small corrections. 24 Q. Okay. That was my next question was 25 going be: Sitting here today, is there anything</p>	<p style="text-align: right;">Page 13</p> <p>1 Q. Not relied upon. Okay. 2 So with those corrections, is there 3 anything else in your report that you do not 4 believe is correct or you would not be willing 5 to testify to under oath? 6 A. No. 7 Q. And you are not -- and you're not 8 offering any opinions in the case other those 9 that are described in the report we've just been 10 discussing? 11 A. I am not. 12 Q. Thank you. Okay. So you -- you have a 13 BS in mathematics at MIT; is that correct? 14 A. Yes, I do. 15 Q. And yours is a Ph.D. in computer science 16 from the University of New Mexico; is that 17 correct? 18 A. Yes. 19 Q. Aside from your BS in mathematics and 20 your Ph.D. in computer science, do you do any 21 other academic degrees? 22 A. I do not. 23 Q. And according to your report, your 24 opinion in this case is based on your experience 25 in computer science; is that correct?</p>

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<p style="text-align: right;">Page 14</p> <p>1 A. Yes.</p> <p>2 Q. So I want to talk a bit more about your</p> <p>3 expertise and what you refer to as, quote,</p> <p>4 "secure distributed systems" or, quote, "complex</p> <p>5 distributed computer systems."</p> <p>6 Can you please describe to me the types</p> <p>7 of the issues that that -- that those areas</p> <p>8 involve?</p> <p>9 A. So my background and what I went to</p> <p>10 graduate to was to study complex systems --</p> <p>11 complex adaptive systems and related field of</p> <p>12 artificial life. Through the course of my -- my</p> <p>13 Ph.D., I ended up in the area of computer</p> <p>14 security under the inspiration of trying to</p> <p>15 build computer immune systems.</p> <p>16 So my background is very</p> <p>17 interdisciplinary. My degree is in computer</p> <p>18 science, but I draw upon information from lots</p> <p>19 of other fields, so when I look at -- when I say</p> <p>20 my expertise is in, you know, complex</p> <p>21 distributed computer systems, it's coming from</p> <p>22 there, and I've combined that with my experience</p> <p>23 doing research and computer security and</p> <p>24 teaching operating systems and distributing</p> <p>25 operating systems and my other various startup</p>	<p style="text-align: right;">Page 16</p> <p>1 of -- of these systems. It's not my entire</p> <p>2 expertise.</p> <p>3 Q. But that does not intend to the substance</p> <p>4 of what the systems are designed to do. For</p> <p>5 example, for the business logic; is that</p> <p>6 correct?</p> <p>7 MR. HILLEGAS: Objection; form.</p> <p>8 THE WITNESS: So the area of complex</p> <p>9 adaptive systems is a very broad umbrella.</p> <p>10 Typically, it's thought of as sets of agents or</p> <p>11 entities or individuals interacting in an</p> <p>12 environment typically reproducing in some way or</p> <p>13 growing in some way and adapting to each other</p> <p>14 and changing their environment.</p> <p>15 That framework can apply to, you</p> <p>16 know, certainly computer systems, which I</p> <p>17 studied the most, but it also applies to living</p> <p>18 systems, whether you're talking about</p> <p>19 multicellular organisms or you're talking about</p> <p>20 ecologies.</p> <p>21 It also applies to political and</p> <p>22 economic systems and social systems. It's --</p> <p>23 it's a -- it's something that tries to capture a</p> <p>24 slice of a lot of the world. So aspects of that</p> <p>25 can apply to, like, things like business logic.</p>
<p style="text-align: right;">Page 15</p> <p>1 work.</p> <p>2 Q. So when we're talking about complex</p> <p>3 distributed systems, is it fair to say that your</p> <p>4 expertise includes the types of computing</p> <p>5 infrastructure that are required to operate those</p> <p>6 systems and do things like make sure that</p> <p>7 they're secure, that there's concurrencies</p> <p>8 handled correctly, there's no unauthorized</p> <p>9 access. Is -- is that the type of expertise you</p> <p>10 got?</p> <p>11 A. In part, yes.</p> <p>12 Q. Okay. And what else would -- what else</p> <p>13 would you add to that list?</p> <p>14 A. So in the context -- so in teaching -- so</p> <p>15 I teach courses in operating systems, so</p> <p>16 understanding the low-level -- low-level</p> <p>17 computer systems operate and get them up to</p> <p>18 application-level code. And I've taught in the</p> <p>19 area of distributed operating systems, which is</p> <p>20 how these systems get connected to support</p> <p>21 large-scale distributed applications.</p> <p>22 And so it's in my expertise at the level</p> <p>23 of understanding how these systems are coded at</p> <p>24 a low level and how they're architected at a</p> <p>25 high level. And that's my expertise in the area</p>	<p style="text-align: right;">Page 17</p> <p>1 But that is not my area of focus.</p> <p>2 BY MR. STEINTHAL:</p> <p>3 Q. Okay. But if we focus on the moment on</p> <p>4 the computer -- computer analyzations of this</p> <p>5 concept of distributed systems, those can apply</p> <p>6 in a range -- those can be a used in a range of</p> <p>7 different business areas, correct?</p> <p>8 MR. HILLEGAS: Objection; form.</p> <p>9 THE WITNESS: Certainly computer</p> <p>10 systems can be used to solve all sorts of</p> <p>11 problem, including a wide variety of business</p> <p>12 problems.</p> <p>13 BY MR. STEINTHAL:</p> <p>14 Q. To give an example, are you familiar with</p> <p>15 system known as AlphaFold?</p> <p>16 A. Yes.</p> <p>17 Q. Okay. Is it -- is it fair to say it's an</p> <p>18 AI system that predicts the 3D structure of</p> <p>19 proteins from their amino acid sequences?</p> <p>20 A. Yes.</p> <p>21 Q. Would -- to the best of your knowledge,</p> <p>22 would you describe that as a complex distributed</p> <p>23 computer system?</p> <p>24 A. I regard it as a certainly a distributed</p> <p>25 computer system. It's complex in a more</p>

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<p style="text-align: right;">Page 18</p> <p>1 standard sense in the sense of there's just a 2 lot of code doing a lot of things, but 3 architecturally, it's in some ways kind of 4 simple because it's not interacting with the 5 world in a realtime basis and not dealing with 6 competing parties. It's just, here's the task, 7 go compute it, give me an answer. So that's 8 fitting more into the simple model of 9 computations even though it is highly concurrent 10 and there. 11 So complex can, of course, mean a lot of 12 different things. When I use it in the context 13 of complex adaptive systems, I'm more talking 14 about the adaptive evolving systems. 15 Q. So with the exception of the Google 16 system that we're goes to discuss today, can you 17 give me another example of a complex distributed 18 system that you've studied? 19 A. The web in general is something I've 20 spent -- I've spent a lot of time thinking 21 about. And you know, the Internet -- I tried to 22 take inspiration from the human immune system, 23 which is a complex adaptive system and trying to 24 figure out how we could build artificial 25 versions of it or aspects of that into computer</p>	<p style="text-align: right;">Page 20</p> <p>1 perspective would not make you an expert in 2 computational biology, would it? 3 MR. HILLEGAS: Objection; form. 4 THE WITNESS: Knowing just how the 5 system operates, you know, in terms of the 6 architecture of the code and stuff, certainly 7 would not make me an expert in computational 8 biology. That is certainly a separate concern. 9 I'm just saying because of my 10 interesting complex practice systems and I was 11 interested in biology and considered 12 computational biology, I -- I've also thought 13 about that other level in that example. 14 BY MR. STEINTHAL: 15 Q. But in general, if I give a different 16 example, if you were building complex 17 distributed system, you would want to have a -- 18 you would be working with subject matter domain 19 experts who understood the domain knowledge that 20 would be paired with your knowledge on the 21 computing side of the -- how to make it work 22 correctly; is that a fair statement? 23 A. Certainly one -- one of the key feature 24 of being a computer scientist is you're building 25 tools that be can used by lots of other, and you</p>
<p style="text-align: right;">Page 19</p> <p>1 systems to give them similar properties. 2 Q. And going back to the AlphaFold example 3 which is simpler than the complex systems that 4 you were describing, your expertise would be 5 relevant to understanding how it works, how it 6 ensures, you said concurrency, how it ensures 7 that results are correct; is that fair? 8 MR. HILLEGAS: Objection; form. 9 THE WITNESS: So my expertise 10 relating to AlphaFold would be, you know, 11 certainly with the underlying computing system 12 and how to run the large jobs that are required 13 to make it work. 14 I also -- I wouldn't say I'm an 15 expert. I have definite background in biology. 16 I understand the protein folding problem which 17 is problem I've thought about some. And then 18 also it's an AI system, and I've -- much of my 19 work in computer security has overlapped with 20 AI. And I have expertise in -- in machine 21 learning, particularly as applied to computer 22 security. 23 BY MR. STEINTHAL: 24 Q. But the fact that you can understand how 25 a system is architected from a computing</p>	<p style="text-align: right;">Page 21</p> <p>1 want to work with experts in those areas and 2 merge your expertise of the systems with their 3 expertise, and so, yes, you do want domain 4 experts. 5 Q. Now turning to your opinions in this 6 matter, do offer any opinions that are beyond 7 those that relate directly to your computer 8 science? 9 A. No. I do not offer any expert opinions 10 beyond what are covered in my report. Again, 11 my -- most of the work in my report is based on 12 my understanding of computer systems, but a bit 13 of my perspective is always influenced by the 14 larger frame of complex adaptive systems. 15 Q. Are you an expert in economics? 16 A. I am not. 17 Q. Are you an expert in industrial 18 organization? 19 MR. HILLEGAS: Objection; form. 20 (Reporter clarification.) 21 BY MR. STEINTHAL: 22 Q. Are you an expert in industrial 23 organization? 24 MR. HILLEGAS: Objection; form. 25 THE WITNESS: I am not an expert in</p>

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<p style="text-align: right;">Page 22</p> <p>1 industrial organization, except to the degree it</p> <p>2 would over -- overlap some with complex adaptive</p> <p>3 systems as a general framework.</p> <p>4 BY MR. STEINTHAL:</p> <p>5 Q. You are not an expert in auction theory,</p> <p>6 are you?</p> <p>7 MR. HILLEGAS: Objection; form.</p> <p>8 THE WITNESS: Again, I am not except</p> <p>9 for where it would overlap with the area of</p> <p>10 complex adaptive systems.</p> <p>11 BY MR. STEINTHAL:</p> <p>12 Q. Could you give me an example of how</p> <p>13 auction theory would overlap with complex</p> <p>14 distributive systems?</p> <p>15 A. A classic area of study in complex</p> <p>16 adaptive systems is understanding evolutionary</p> <p>17 dynamics. And related to evolutionary dynamics</p> <p>18 is -- game theory has often been applied, and</p> <p>19 game theory is also a framework that is applied</p> <p>20 in economic context.</p> <p>21 But -- so problems like the prisoner's</p> <p>22 dilemma and trying to understand how trust</p> <p>23 develops in a population. So that is not</p> <p>24 economics, but that is -- you know, there are</p> <p>25 some overlap conceptually.</p>	<p style="text-align: right;">Page 24</p> <p>1 antitrust law.</p> <p>2 BY MR. STEINTHAL:</p> <p>3 Q. Are you an expert in marketing?</p> <p>4 MR. HILLEGAS: Objection; form.</p> <p>5 THE WITNESS: No.</p> <p>6 BY MR. STEINTHAL:</p> <p>7 Q. Are you an expert in advertising?</p> <p>8 MR. HILLEGAS: Objection; form.</p> <p>9 THE WITNESS: I have expertise in --</p> <p>10 you know, in the technology underlying online</p> <p>11 advertising, but I'm not an expert in</p> <p>12 advertising beyond that.</p> <p>13 BY MR. STEINTHAL:</p> <p>14 Q. And talking about technology, what</p> <p>15 experience, training, or expertise would you say</p> <p>16 you have in advertising technology?</p> <p>17 A. My experience and expertise relating to</p> <p>18 the advertising technology is really in the</p> <p>19 context of advertising technology is a use-case</p> <p>20 of web technology, for the most part.</p> <p>21 I mean, it's -- we distribute an ad. An</p> <p>22 ad is, you know, a web document that's</p> <p>23 incorporated into another web document, and so</p> <p>24 understanding how that process works is -- you</p> <p>25 don't have to understand web technologies and,</p>
<p style="text-align: right;">Page 23</p> <p>1 Q. Would you say you're an expert in game</p> <p>2 theory?</p> <p>3 A. I'm not an expert in game theory;</p> <p>4 however, I have written papers which have</p> <p>5 incorporated game theory into their analysis.</p> <p>6 Q. Are your opinions in this case derived</p> <p>7 from your knowledge or expertise in game theory?</p> <p>8 A. Not directly.</p> <p>9 Q. Are you an expert in market design?</p> <p>10 MR. HILLEGAS: Objection; form.</p> <p>11 THE WITNESS: Again I'm not expert</p> <p>12 in market design except maybe how it would</p> <p>13 overlap with my general interest in complex</p> <p>14 adaptive systems.</p> <p>15 BY MR. STEINTHAL:</p> <p>16 Q. Are you an expert in antitrust or</p> <p>17 competition economics?</p> <p>18 MR. HILLEGAS: Objection; form.</p> <p>19 THE WITNESS: I at not except where</p> <p>20 it might overlap with complex adaptive systems.</p> <p>21 BY MR. STEINTHAL:</p> <p>22 Q. And I assume you're not an expert in</p> <p>23 antitrust law, are you?</p> <p>24 MR. HILLEGAS: Objection; form.</p> <p>25 THE WITNESS: Definitely not</p>	<p style="text-align: right;">Page 25</p> <p>1 you know, distributed network technologies.</p> <p>2 Q. Is fair to say that that expertise is</p> <p>3 focused on the technical aspects of how the ad</p> <p>4 is displayed, how the ad is rendered to the</p> <p>5 user, things like that?</p> <p>6 MR. HILLEGAS: Objection; form.</p> <p>7 THE WITNESS: I would say the</p> <p>8 expertise applies with the full loop of from</p> <p>9 where an ad would be requested to the ad being</p> <p>10 sent off to being processed and the ad coming --</p> <p>11 and -- and coming back. It wouldn't be</p> <p>12 necessarily in the algorithms per se that are</p> <p>13 used to choose the ad because that would get</p> <p>14 into a, you know, business, you know,</p> <p>15 domain-specific things.</p> <p>16 But the whole -- otherwise that loop</p> <p>17 of how that is fulfilled and -- and then, of</p> <p>18 course, also modern systems use machine-learning</p> <p>19 technology in order to make those decisions, and</p> <p>20 I have similar expertise in machine learning.</p> <p>21 BY MR. STEINTHAL:</p> <p>22 Q. So you would say that you have expertise</p> <p>23 in the various technologies that underlie how</p> <p>24 the system works but not necessarily in the</p> <p>25 business logic of how to operate that business</p>

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<p style="text-align: right;">Page 26</p> <p>1 or why are we doing the things in particular in 2 that business; is that correct? 3 MR. HILLEGAS: Objection; form. 4 THE WITNESS: I agree that my 5 expertise in -- is in how the ads would be 6 served and not -- not in the business-logic 7 aspect of the actual decisions. 8 BY MR. STEINTHAL: 9 Q. And briefly going back to the topics of 10 game theory and auction theory you mentioned 11 earlier, you said you're familiar with those 12 concepts from work you've done in distributed 13 systems; is that correct? 14 MR. HILLEGAS: Objection; form. 15 THE WITNESS: One of my -- one my 16 central interests is in understanding what makes 17 systems secure, and related to what makes 18 systems secure, I try to draw upon -- draw upon 19 biology and what makes living systems secure. 20 One thing that makes living systems 21 secure is diversity. And so I've been trying to 22 understand why is diversity an effective 23 security mechanism. To understand why diversity 24 is, you know, a useful security mechanism, I've 25 tried to model interactions in a security</p>	<p style="text-align: right;">Page 28</p> <p>1 framework but specifically computer security, 2 you know, building -- trying to build a computer 3 immune system was my dissertation. 4 Q. And did you take any courses at the time? 5 A. I was a teaching assistant during my 6 early years. 7 Q. And did any of the courses that you 8 assisted with relate to economics? 9 A. No, they did not. 10 Q. Did any of them relate to advertising 11 technology? 12 MR. HILLEGAS: Objection; form. 13 THE WITNESS: The courses I -- ITA 14 did not involve economics. 15 BY MR. STEINTHAL: 16 Q. Okay. Thank you. 17 So it's actually not then; it's a year 18 earlier. You said you teaching assistant. 19 Would that distinct from your role as a research 20 assistant we just mentioned? 21 A. Yes. 22 Q. And in that -- in that earlier role, did 23 you teach or facilitate any courses related to 24 economics? 25 A. I did not.</p>
<p style="text-align: right;">Page 27</p> <p>1 context in a more theoretical way. Some of the 2 models I've proposed with my students have 3 involved game theory because it's really about, 4 you know, attack, defense. What's the attack or 5 strategy; what's the defender strategy? 6 So -- and again, this is all related 7 to the larger thing of complex adaptive systems. 8 BY MR. STEINTHAL: 9 Q. Okay. Thank you. And let's talk for a 10 bit about your professional expertise. I'm 11 sorry. Your professional experience. 12 Your CV is at the back of your report. I 13 don't know if you -- feel free to look at it 14 too. But I've been looking at it. You 15 obviously know it. It was your own life. 16 A. Yes, exactly. Some of it has been a 17 while. 18 Q. So starting at the beginning of -- of 19 your professional work, you were a research 20 assistant at the University of New Mexico from 21 1995 to 2002; is that correct? 22 A. Yes. 23 Q. And what areas you were researching at 24 the time? 25 A. Complex adaptive systems as a general</p>	<p style="text-align: right;">Page 29</p> <p>1 Q. And in that earlier role, did you teach 2 or facilitate any courses related to advertising 3 technology? 4 MR. HILLEGAS: Objection; form. 5 THE WITNESS: I did not teach any 6 courses related to economics. 7 BY MR. STEINTHAL: 8 Q. Okay. I'm sorry. The question was: In 9 that earlier role, did you teach or facilitate 10 any courses related to advertising technology? 11 A. No, I did not. 12 MR. HILLEGAS: Objection; form. 13 THE WITNESS: I did not teach or 14 assist with any courses on advertising 15 technology. 16 BY MR. STEINTHAL: 17 Q. And then after -- after that, you were a 18 visiting grad student at the artificial 19 intelligence laboratory at MIT from 1996 to 20 1997; is that correct? 21 A. Yes. 22 Q. And did you teach any courses in that 23 role? 24 A. I did not. 25 Q. Are you relating -- are any of your</p>

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<p style="text-align: right;">Page 30</p> <p>1 opinions today related to artificial Intel 2 against? 3 MR. HILLEGAS: Objection; form. 4 THE WITNESS: My opinions in here do 5 refer to machine-learning models that are used, 6 but I do not discuss their operation. 7 BY MR. STEINTHAL: 8 Q. Thank you. In 2003 you worked as a 9 consultant for Sandia National Laboratories; is 10 that correct? 11 A. Yes. 12 Q. What were your day-to-day 13 responsibilities in that role? 14 A. During that position, I was taking my 15 dissertation work, which was building a realtime 16 anomaly detection system for Linux that have 17 been developed running on -- on servers and on 18 desktops, and I was porting it to run on a 19 robot. 20 Q. And then for 2003, 2016, you were a 21 consultant for SkillBridge Training LLC; is that 22 correct? 23 A. Yes. 24 Q. How would you describe SkillBridge's 25 business?</p>	<p style="text-align: right;">Page 32</p> <p>1 BY MR. STEINTHAL: 2 Q. Did any of the courses that you taught or 3 developed relate to economics? 4 A. Those courses did not relate to 5 economics. 6 Q. And did any of the courses that you 7 taught or developed relate to advertising 8 technology? 9 MR. HILLEGAS: Objection; form. 10 THE WITNESS: Those SkillBridge 11 courses did not relate to advertising 12 technology. 13 BY MR. STEINTHAL: 14 Q. So moving on, from 2012 to the present 15 you say that you are adviser for Zighra, 16 Z-I-G-H-R-A, Inc., in Ottawa in Ontario County; 17 is that correct? 18 A. Yes, it is. 19 Q. And how -- what is Zighra's business? 20 A. Zighra is a -- is a computer security 21 firm. They offer solutions. I can say 22 specifically what I worked with them is on 23 behavioral biometric technology. 24 So being able to identify people by how 25 they swipe on a phone. That was the patents</p>
<p style="text-align: right;">Page 31</p> <p>1 MR. HILLEGAS: Objection; form. 2 THE WITNESS: SkillBridge is a -- I 3 call it corporate training company. They 4 would -- they would have contracts to teach 5 courses to businesses in various areas. So I 6 worked with them as -- as an instructor for 7 hire. Sometimes to teach courses that had been 8 previously developed, and other times to teach 9 courses that I developed. 10 BY MR. STEINTHAL: 11 Q. And what was the subject matters of those 12 courses? 13 MR. HILLEGAS: Objection; form. 14 THE WITNESS: The courses that I 15 taught that I did not develop were primarily on 16 programming or system administration. The 17 courses that I taught on my own -- that I 18 developed and taught -- I codeveloped and taught 19 courses computer security. 20 BY MR. STEINTHAL: 21 Q. And did any of those courses that you 22 taught or developed relate to auction theory? 23 MR. HILLEGAS: Objection; form. 24 THE WITNESS: The courses I taught 25 did not relate to auction theory.</p>	<p style="text-align: right;">Page 33</p> <p>1 that are in my CV are mostly related to that. 2 And then more recently they're working on the 3 security of GNM -- GNSS systems which is an 4 umbrella-term for GPS and similar satellite -- 5 satellite positioning constellations. 6 Q. Does Zighra do any work relating to 7 advertising technology? 8 MR. HILLEGAS: Objection; form. 9 THE WITNESS: It does not. 10 BY MR. STEINTHAL: 11 Q. From November 16 to July 2018, you were 12 the chief scientist at Secure Lytix, S-E-C-U-R-E 13 L-Y-T-I-X Inc.; is that correct? 14 A. Yes. 15 Q. And what is Secure Lytics's business? 16 A. Secure Lytics's business was to -- was to 17 create security solutions for enterprise 18 applications. 19 Q. And what were your responsibilities in 20 that role as chief scientist? 21 A. I was the lead for developing the 22 prototypes for -- for detecting anomalous 23 behavior in enterprise applications. 24 Q. Did any Secure Lytics's word relate to 25 advertising technology?</p>

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<p style="text-align: right;">Page 34</p> <p>1 MR. HILLEGAS: Objection; form. 2 THE WITNESS: Its work did not 3 relate to advertising technology. 4 BY MR. STEINTHAL: 5 Q. From March 2022 to May 2024 you said on 6 your CV that you were a consultant for Allens in 7 Australia; is that correct? 8 A. Yes. 9 Q. And Allens is a law firm? 10 A. It is. 11 Q. And you served as expert witness in that 12 role; is that correct? 13 A. I did. 14 Q. Did you provide any services other than 15 serving as the witness? 16 MR. HILLEGAS: Caution the witness 17 not to disclose any information that is subject 18 to any confidentiality agreements that you may 19 have signed with any other parties, including 20 Allens. 21 THE WITNESS: I just served as an 22 expert witness. 23 BY MR. STEINTHAL: 24 Q. And without violating any privileges or 25 court orders, can you tell me if any of your</p>	<p style="text-align: right;">Page 36</p> <p>1 Q. And is that list of courses, to your 2 knowledge, complete? 3 A. The list of courses is complete. I don't 4 think it -- yeah, it does not have this 5 semester. I am teaching 2406, the fundamentals 6 of web applications. I have around 400 students 7 right now, so... 8 Q. That's lot of exams to grad. 9 A. I have 14 TAs. 10 Q. That helps. 11 Is it fair to say that basis of the 12 courses you have not taught any courses about 13 advertising technology? 14 MR. HILLEGAS: Objection; form. 15 THE WITNESS: I have not any courses 16 about advertising technology. 17 BY MR. STEINTHAL: 18 Q. Have you taught any courses related to 19 auction theory? 20 MR. HILLEGAS: Objection; form. 21 THE WITNESS: I have not taught any 22 courses on auction theory. 23 BY MR. STEINTHAL: 24 Q. Have you taught any courses related to 25 economics?</p>
<p style="text-align: right;">Page 35</p> <p>1 work for Allens involved cases related to 2 advertising technology? 3 MR. HILLEGAS: Objection; form. 4 THE WITNESS: I can say that the 5 case was about the distribution of mobile 6 applications, and mobile applications do use, 7 you know, advertising. 8 BY MR. STEINTHAL: 9 Q. Was there only one case you worked on? 10 A. I worked on two cases. It was Epic Games 11 versus Google and Epic Games versus Apple. 12 Q. We'll talk about that one. Thank you. 13 Now turning to your experience at 14 Carleton University, you began teaching as an 15 assistant Professor in 2003; is that correct? 16 A. I did. 17 Q. And you were assistant Professor until 18 2008? 19 A. Yes. 20 Q. After which you were promoted to 21 associate Professor? 22 A. Yes. 23 Q. And are the courses that you taught in 24 that role reflected on your CV? 25 A. They are.</p>	<p style="text-align: right;">Page 37</p> <p>1 MR. HILLEGAS: Objection; form. 2 THE WITNESS: I have not taught any 3 courses on economics. 4 BY MR. STEINTHAL: 5 Q. Okay. So we've discussed a number of 6 your employment since college. 7 Have you held any post-college jobs that 8 not listed in your CV or that we have not 9 previously discussed? 10 A. No. 11 Q. So it's -- is it correct that none of 12 your professional experience was working for an 13 ad tech company? 14 A. Yes. 15 Q. Have you done any work developing, 16 maintaining, or managing any ad tech products? 17 A. No. 18 Q. So that would include an ad server? Is 19 that included in your definition of ad tech 20 products? 21 MR. HILLEGAS: Objection; form. 22 THE WITNESS: I have certainly 23 maintained web servers but not ad servers. 24 BY MR. STEINTHAL: 25 Q. And have you done any work developing and</p>

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<p style="text-align: right;">Page 38</p> <p>1 maintaining or managing an ad exchange? 2 MR. HILLEGAS: Objection; form. 3 THE WITNESS: I have not done any 4 work related to ad exchanges. 5 BY MR. STEINTHAL: 6 Q. Have you done any -- 7 A. I have not managed any ad exchanges. 8 Q. Have you done any software development or 9 software maintenance related to advertising 10 exchanges? 11 A. No. 12 MR. HILLEGAS: Objection; form. 13 BY MR. STEINTHAL: 14 Q. Have you developed in whole or in part 15 any ad buying tools? 16 MR. HILLEGAS: Objection; form. 17 THE WITNESS: No. 18 BY MR. STEINTHAL: 19 Q. Have you developed -- have you helped to 20 maintain in whole or in part any ad buying 21 tools? 22 MR. HILLEGAS: Objection; form. 23 THE WITNESS: No. 24 BY MR. STEINTHAL: 25 Q. And have you managed any ad buying tools?</p>	<p style="text-align: right;">Page 40</p> <p>1 A. None of my direct employers, I -- I 2 believe, have earned money from advertising; 3 however, I have worked as, you know, consulting, 4 you know, instructor and things, and I would 5 have to ensure if they made money from 6 advertising. 7 Q. But you were not personally involved in 8 any aspect of the business involved in the 9 selling at advertisements; is that correct? 10 MR. HILLEGAS: Objection; form. 11 THE WITNESS: That is correct. 12 BY MR. STEINTHAL: 13 Q. Have you ever personally used any of the 14 Google ad tech products at issue in this case? 15 A. I have not. 16 Q. Have you ever used any ad tech products 17 that were not made by Google? 18 MR. HILLEGAS: Objection; form. 19 THE WITNESS: I have not. 20 BY MR. STEINTHAL: 21 Q. Before today have you ever given a 22 deposition? 23 A. Before today, no. 24 Q. And I believe you mentioned earlier that 25 you testified at trial in Epic Games v Google</p>
<p style="text-align: right;">Page 39</p> <p>1 MR. HILLEGAS: Objection; form. 2 THE WITNESS: No. 3 BY MR. STEINTHAL: 4 Q. In any of your professional roles, were 5 you responsible for placing advertisements or 6 otherwise managing marketing campaigns? 7 MR. HILLEGAS: Objection; form. 8 THE WITNESS: I have not. 9 BY MR. STEINTHAL: 10 Q. In any of your professional roles, were 11 you responsible for selling advertising space? 12 MR. HILLEGAS: Objection; form. 13 THE WITNESS: I have not. 14 BY MR. STEINTHAL: 15 Q. In any of your professional roles, were 16 you responsible for the use or operation of any 17 ad tech tools? 18 MR. HILLEGAS: Objection; form. 19 THE WITNESS: I have not been 20 responsible for use or operation of any ad tech 21 tools. 22 BY MR. STEINTHAL: 23 Q. To best of your knowledge, did any of 24 your employers earn money from the sale of 25 advertising while you were working for them?</p>	<p style="text-align: right;">Page 41</p> <p>1 and Epic Games v Apple; is that correct? 2 A. Yes. 3 Q. Have you testified in any other trials 4 besides those two? 5 A. I have not testified in any other trials. 6 Q. And referring to those two-cases, Epic 7 Games v Google and Epic Games v Apple, is it 8 correct you testified on behalf of Epic Games? 9 A. Yes. 10 Q. And when did that testimony occur? 11 A. Late May of 2024. 12 Q. And again without violating any 13 confidentiality or protective orders issued by 14 any court, were the opinions you testified to -- 15 strike that. 16 Without violating any confidentiality 17 protective orders entered by any court, can you 18 please tell me the nature of your opinions at a 19 high level in those cases? 20 A. I don't believe I can disclose those 21 opinions here. 22 Q. There is confidentiality order that 23 protects the contents of those opinions? 24 A. Yes. And the -- and -- and the trial -- 25 I mean, the decision has not been rendered in</p>

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<p style="text-align: right;">Page 42</p> <p>1 the case.</p> <p>2 Q. What was the issue in that case?</p> <p>3 MR. HILLEGAS: Objection; form.</p> <p>4 THE WITNESS: Well, Epic Games was</p> <p>5 challenging Apple and Google's model for app</p> <p>6 distribution where they essentially maintained</p> <p>7 control of how apps were distributed.</p> <p>8 BY MR. STEINTHAL:</p> <p>9 Q. And you testified in those trials. Was</p> <p>10 that testimony public?</p> <p>11 MR. HILLEGAS: Objection; form.</p> <p>12 THE WITNESS: I believe the -- yeah,</p> <p>13 I believe the testimony was streamed live over</p> <p>14 the web. But I don't know if it was -- you</p> <p>15 know, I don't know exactly what the rules are</p> <p>16 regarding what I can say about that -- you know,</p> <p>17 that testimony.</p> <p>18 BY MR. STEINTHAL:</p> <p>19 Q. Can you tell me whether or not any of the</p> <p>20 testimony you gave in that case related to</p> <p>21 advertising technology?</p> <p>22 MR. HILLEGAS: Objection; form.</p> <p>23 THE WITNESS: I don't think I can</p> <p>24 talk about the details of the arguments that I</p> <p>25 made in that case.</p>	<p style="text-align: right;">Page 44</p> <p>1 A. I have not.</p> <p>2 Q. And just for the record, I'm going to</p> <p>3 ask, without violate any confidential protective</p> <p>4 orders, can you summarize for me the nature of</p> <p>5 the opinions in the expert reports in Epic Games</p> <p>6 v Apple and Epic Games v Google?</p> <p>7 A. I don't believe I'm at liberty to</p> <p>8 summarize those here.</p> <p>9 Q. For how long did you work on Epic Games v</p> <p>10 Google?</p> <p>11 A. The start of that I think was early --</p> <p>12 early 2023, maybe late -- maybe late 2022. I'm</p> <p>13 not sure exactly. The two -- the two cases were</p> <p>14 overlapping.</p> <p>15 Q. And did -- when -- when approximately did</p> <p>16 your work conclude or is it ongoing?</p> <p>17 A. That work concluded in May 2024.</p> <p>18 Q. So is it fair say you worked for</p> <p>19 approximately two years on those cases?</p> <p>20 MR. HILLEGAS: Objection; form.</p> <p>21 THE WITNESS: On those two cases,</p> <p>22 yeah, they were approximately two years, yes.</p> <p>23 BY MR. STEINTHAL:</p> <p>24 Q. Okay. Do you have any sense of how many</p> <p>25 total hours you worked on those two cases over</p>
<p style="text-align: right;">Page 43</p> <p>1 BY MR. STEINTHAL:</p> <p>2 Q. Are you relying on any information you</p> <p>3 gained in the course of that engagement in</p> <p>4 forming your opinions in this case?</p> <p>5 MR. HILLEGAS: Objection; form.</p> <p>6 Same caution not to disclose</p> <p>7 confidentiality information, but you can answer</p> <p>8 yes or no.</p> <p>9 THE WITNESS: No.</p> <p>10 BY MR. STEINTHAL:</p> <p>11 Q. Have you ever issued a written report or</p> <p>12 declaration in a legal proceeding?</p> <p>13 MR. HILLEGAS: Objection; form.</p> <p>14 THE WITNESS: I have written</p> <p>15 reports.</p> <p>16 BY MR. STEINTHAL:</p> <p>17 Q. And did you write an expert report in</p> <p>18 Epic Games v Apple?</p> <p>19 A. I did.</p> <p>20 Q. Did you write a report in Epic Games v</p> <p>21 Google?</p> <p>22 A. I did.</p> <p>23 Q. Have you submitted or filed any expert</p> <p>24 course in any other litigation besides those two</p> <p>25 cases and this one?</p>	<p style="text-align: right;">Page 45</p> <p>1 those two years?</p> <p>2 A. I'm not sure of the exact number of</p> <p>3 hours, but it was a considerable number of</p> <p>4 hours.</p> <p>5 Q. Do you have any estimate of the total</p> <p>6 compensation you received for your work on those</p> <p>7 two cases?</p> <p>8 A. In total it would probably be -- probably</p> <p>9 a few hundred thousand, I think.</p> <p>10 Q. And is it possible to estimate how much</p> <p>11 of that was related to the Google matter versus</p> <p>12 the Apple matter?</p> <p>13 A. It was approximately half and half.</p> <p>14 Q. To the best of your knowledge, has -- has</p> <p>15 any court excluded or stricken your testimony in</p> <p>16 whole or in part?</p> <p>17 A. No.</p> <p>18 Q. And to the best of your knowledge, has a</p> <p>19 court ever discussed your expert testimony or</p> <p>20 proposed your expert testimony in any written</p> <p>21 decisions or opinions?</p> <p>22 A. Not that I know of. But the cases in</p> <p>23 which I testified, the decision hasn't been</p> <p>24 reached yet, so...</p> <p>25 Q. Did you have any opinions about Google</p>

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<p style="text-align: right;">Page 46</p> <p>1 prior to work on the Epic v Google case?</p> <p>2 A. I have had ongoing interactions with</p> <p>3 Google as a customer, and -- and I am still a</p> <p>4 customer with them, so I have had positive</p> <p>5 opinions with that. But as terms of an</p> <p>6 expertise or anything -- oh, I have had -- I</p> <p>7 have taught courses in which I have covered</p> <p>8 Google's infracture and distributing operating</p> <p>9 systems. I've taught papers on -- that -- that</p> <p>10 have been published by Google's staff and</p> <p>11 researches about how their system works, and I</p> <p>12 basically explain to students how Google</p> <p>13 developed a lot of key technologies.</p> <p>14 Q. Would you say that your general opinions</p> <p>15 about Google changed in any material way from</p> <p>16 your work on the Epic v Google case?</p> <p>17 MR. HILLEGAS: Objection; form.</p> <p>18 THE WITNESS: I would say my -- my</p> <p>19 overall views haven't changed significantly.</p> <p>20 BY MR. STEINTHAL:</p> <p>21 Q. One last question in this line.</p> <p>22 Without revealing the parties or the case</p> <p>23 or the substance of your opinions or any</p> <p>24 conversation you've had with another attorney,</p> <p>25 and with the exception of the Apple -- the</p>	<p style="text-align: right;">Page 48</p> <p>1 A. That sounds correct.</p> <p>2 Q. Were you approached by the State of</p> <p>3 Texas, or did you approach them about the</p> <p>4 written engagement?</p> <p>5 A. I was approached by the State of Texas.</p> <p>6 Q. Through counsel?</p> <p>7 A. Yes.</p> <p>8 Q. When approximately did you learn that</p> <p>9 you'd be preparing an expert witness in which</p> <p>10 case?</p> <p>11 A. That -- those were my initial</p> <p>12 conversations was that I would be doing so.</p> <p>13 Q. And when would you say you started to do</p> <p>14 work on the report that you submitted in this</p> <p>15 Exhibit 1 in this case? Also approximately mid</p> <p>16 June?</p> <p>17 A. I began preparation to write a report</p> <p>18 soon after I started, you know, so I started.</p> <p>19 Q. Has your understanding -- strike that.</p> <p>20 In paragraph five of your report, you</p> <p>21 state that you're being compensated for your</p> <p>22 work in this matter at a rate of \$600 per hour;</p> <p>23 is that still correct?</p> <p>24 A. It is.</p> <p>25 Q. And approximately how many hours would</p>
<p style="text-align: right;">Page 47</p> <p>1 Apple -- the Epic v Apple and Epic v Google that</p> <p>2 we discussed earlier, have you done any other</p> <p>3 work as a consulting or testifying expert</p> <p>4 witness that involved display advertising</p> <p>5 technology?</p> <p>6 MR. HILLEGAS: Objection; form.</p> <p>7 BY MR. STEINTHAL:</p> <p>8 Q. Besides this case?</p> <p>9 A. I have not.</p> <p>10 Q. Who retained you in this case?</p> <p>11 A. The State of Texas.</p> <p>12 Q. And without violating any privilege or</p> <p>13 disclosing the contents of any conversation with</p> <p>14 counsel, have you been retained by the State of</p> <p>15 Texas or any other state in any other litigation</p> <p>16 matters?</p> <p>17 A. I have not.</p> <p>18 Q. Approximately when were you retained in</p> <p>19 this case?</p> <p>20 A. Approximately mid June of this year.</p> <p>21 Q. And that's approximately when you signed</p> <p>22 the protective order in this case?</p> <p>23 A. Approximately, yes.</p> <p>24 Q. If I represented that your signature was</p> <p>25 dated June 14th, that's approximate?</p>	<p style="text-align: right;">Page 49</p> <p>1 you say you spent on this case so far?</p> <p>2 A. I spent approximately 200 hours at this</p> <p>3 point.</p> <p>4 Q. Do you know how much you've billed for</p> <p>5 your work on this matter so far?</p> <p>6 A. It would be you know 200 times 600, so...</p> <p>7 Q. Okay. And do you receive 100 percent of</p> <p>8 your bill time as compensation, or do you share</p> <p>9 it with any firm or consulting group?</p> <p>10 A. 100 percent goes to me.</p> <p>11 Q. And you bill the State of Texas directly?</p> <p>12 A. I do.</p> <p>13 Q. Other than counsel for the plaintiffs,</p> <p>14 did anyone assist you in preparing your report?</p> <p>15 MR. HILLEGAS: Objection; form.</p> <p>16 Caution the witness not to disclose</p> <p>17 any communications that you may have had with</p> <p>18 any staff or assistants, but you may answer the</p> <p>19 question yes or no.</p> <p>20 THE WITNESS: Yes.</p> <p>21 BY MR. STEINTHAL:</p> <p>22 Q. And were those individuals affiliated</p> <p>23 with any organization or company?</p> <p>24 MR. HILLEGAS: Same objection.</p> <p>25 You may answer with a name if you</p>

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<p style="text-align: right;">Page 50</p> <p>1 have it, but do not disclose any of the</p> <p>2 communications that you may have had.</p> <p>3 THE WITNESS: So you're asking what</p> <p>4 the affiliation was of anyone who --</p> <p>5 BY MR. STEINTHAL:</p> <p>6 Q. Well, you testified that there are</p> <p>7 individuals other than counsel and plaintiffs</p> <p>8 who assist you in preparing your report; is that</p> <p>9 correct?</p> <p>10 MR. HILLEGAS: Objection; form.</p> <p>11 THE WITNESS: Yes.</p> <p>12 BY MR. STEINTHAL:</p> <p>13 Q. How many potential individuals are there?</p> <p>14 MR. HILLEGAS: Objection; form.</p> <p>15 Again you may disclose the number of</p> <p>16 individuals, but do not disclose any</p> <p>17 communications that you had or any work that was</p> <p>18 done in preparation for your report.</p> <p>19 THE WITNESS: Approximately six</p> <p>20 people.</p> <p>21 BY MR. STEINTHAL:</p> <p>22 Q. Okay. Without revealing the substance of</p> <p>23 any conversation you might have had with them,</p> <p>24 can you please give me their names?</p> <p>25 MR. HILLEGAS: Objection; form.</p>	<p style="text-align: right;">Page 52</p> <p>1 THE WITNESS: Keystone Strategies.</p> <p>2 BY MR. STEINTHAL:</p> <p>3 Q. Are all six -- are all of the</p> <p>4 approximately six people that we're referring to</p> <p>5 here affiliated with Keystone Strategies?</p> <p>6 MR. HILLEGAS: Objection; form.</p> <p>7 Under the protective stipulation,</p> <p>8 you may answer the question yes or no, but don't</p> <p>9 provide any communication or names of the</p> <p>10 individuals.</p> <p>11 THE WITNESS: Yes.</p> <p>12 BY MR. STEINTHAL:</p> <p>13 Q. Without revealing the substance of any of</p> <p>14 your communications with those individuals, is</p> <p>15 it your understanding that those six individuals</p> <p>16 have training or experience in computer science?</p> <p>17 MR. HILLEGAS: Objection; form.</p> <p>18 You may provide a yes or no answer</p> <p>19 to the question.</p> <p>20 THE WITNESS: Yes.</p> <p>21 BY MR. STEINTHAL:</p> <p>22 Q. To the best of your knowledge, are any of</p> <p>23 those six individuals trained in economics?</p> <p>24 MR. HILLEGAS: Same objection.</p> <p>25 Same caution to the witness.</p>
<p style="text-align: right;">Page 51</p> <p>1 I'm going to instruct the witness</p> <p>2 not to answer on the basis that providing a name</p> <p>3 might provide communications that are covered by</p> <p>4 the expert stipulation.</p> <p>5 BY MR. STEINTHAL:</p> <p>6 Q. There are six individuals who assisted --</p> <p>7 approximately individuals who assisted you with</p> <p>8 your report, correct?</p> <p>9 MR. HILLEGAS: Objection; form.</p> <p>10 THE WITNESS: Yes.</p> <p>11 BY MR. STEINTHAL:</p> <p>12 Q. To the best of your knowledge, are any of</p> <p>13 those individuals affiliated with the same -- or</p> <p>14 two or more of those individuals affiliated with</p> <p>15 the same company or entity?</p> <p>16 MR. HILLEGAS: Objection; form.</p> <p>17 You may answer the question yes or</p> <p>18 no. Don't provide any communications with any</p> <p>19 individuals.</p> <p>20 THE WITNESS: Yes.</p> <p>21 BY MR. STEINTHAL:</p> <p>22 Q. What is that company or entity?</p> <p>23 MR. HILLEGAS: Same objection.</p> <p>24 You may provide the name of the</p> <p>25 company.</p>	<p style="text-align: right;">Page 53</p> <p>1 THE WITNESS: I'm not sure.</p> <p>2 BY MR. STEINTHAL:</p> <p>3 Q. Is there a particular person on those six</p> <p>4 about who you are unsure?</p> <p>5 MR. HILLEGAS: Same objection and</p> <p>6 caution.</p> <p>7 Instruct the witness not to disclose</p> <p>8 any names or communications, but if there is --</p> <p>9 you can answer the question yes or no, you may.</p> <p>10 THE WITNESS: No.</p> <p>11 BY MR. STEINTHAL:</p> <p>12 Q. So your uncertainty is general across all</p> <p>13 six?</p> <p>14 MR. HILLEGAS: Same objection, same</p> <p>15 caution.</p> <p>16 You may answer yes or no.</p> <p>17 THE WITNESS: Yes.</p> <p>18 BY MR. STEINTHAL:</p> <p>19 Q. Did you personally identify these six</p> <p>20 individuals to work on this case?</p> <p>21 MR. HILLEGAS: Objection; form.</p> <p>22 Same caution. You can answer yes or</p> <p>23 no to the extent you understand the question.</p> <p>24 THE WITNESS: No.</p> <p>25 BY MR. STEINTHAL:</p>

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<p style="text-align: right;">Page 54</p> <p>1 Q. To the best of your knowledge, how were 2 those six individuals selected to work on this 3 case? 4 MR. HILLEGAS: Objection; form. 5 Instruct the witness not to answer 6 as discloses communications with staff and 7 communication -- and any assistants that he may 8 have. 9 BY MR. STEINTHAL: 10 Q. To the best of your knowledge, do any six 11 individuals that we're talking about have 12 training or expertise in auction theory? 13 MR. HILLEGAS: Objection to form, 14 expert stipulations. 15 You can answer yes or no to the 16 extent that you know. 17 THE WITNESS: I'm not sure. 18 BY MR. STEINTHAL: 19 Q. Are you familiar with the academic or 20 professional background of the six individuals 21 we're talking about? 22 MR. HILLEGAS: Same objection, same 23 caution. 24 You may answer yes or no to the 25 extent you know.</p>	<p style="text-align: right;">Page 56</p> <p>1 may have had. To the extent that you know the 2 answer, you may respond yes or no. 3 THE WITNESS: No. 4 BY MR. STEINTHAL: 5 Q. To the best of your knowledge, how many 6 hours in the aggregate did the six individuals 7 we're talking about work in support of your 8 report? 9 MR. HILLEGAS: Same objection, same 10 caution. 11 You may answer to the extent that 12 you know how many hours to the -- you know the 13 answer to that question. 14 THE WITNESS: I don't know. 15 BY MR. STEINTHAL: 16 Q. Did you receive any compensation based in 17 whole or in part on the amount that Keystone 18 Strategies receives for your support team's work 19 on this case? 20 A. I do not. 21 Q. Without revealing the substance of any 22 communications that you may have had with them, 23 did any of six individuals we're discussing 24 draft. 25 Portions of your report?</p>
<p style="text-align: right;">Page 55</p> <p>1 THE WITNESS: No. 2 BY MR. STEINTHAL: 3 Q. Other than counsel and the six 4 individuals we've been talking about from 5 Keystone Strategies, did anyone else assist you 6 in the preparation of your report? 7 MR. HILLEGAS: I'm going to caution 8 the witness not to disclose any communication 9 with either counsel or assistants. You may 10 answer the question yes or no. 11 THE WITNESS: No. 12 BY MR. STEINTHAL: 13 Q. To the best of your knowledge, from 14 approximately June when you started working on 15 this case through the present -- or strike that. 16 To the best of your knowledge and 17 approximately June when you started to work on 18 this case through the date of your report, which 19 is September 9th, 2024, did the six individuals 20 we've been talking about work full-time or 21 substantially full-time in support of your work 22 on this case? 23 MR. HILLEGAS: Objection; form. 24 Caution you not to disclose any 25 communications you may have had, any drafts you</p>	<p style="text-align: right;">Page 57</p> <p>1 MR. HILLEGAS: Objection; form. 2 Instruct the witness not answer 3 under the expert stipulation covering the drafts 4 of the expert report. 5 BY MR. STEINTHAL: 6 Q. Without revealing the substance of any 7 drafts of the report, did you draft -- did you 8 write the first draft of this report? 9 MR. HILLEGAS: Objection; form. 10 You may answer yes or no. 11 THE WITNESS: Yes. 12 BY MR. STEINTHAL: 13 Q. Got a few final questions before we take 14 a break, which hopefully we can get done in the 15 next few minutes. 16 What did you do to prepare for this 17 deposition -- strike that. 18 Without revealing the substance of any 19 communication with counsel or your support team, 20 what did you do to prepare for this deposition 21 today? 22 MR. HILLEGAS: Objection; form. 23 THE WITNESS: I read my expert 24 reports and a few other expert reports involved 25 in this case.</p>

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<p style="text-align: right;">Page 58</p> <p>1 BY MR. STEINTHAL:</p> <p>2 Q. Was one of those reports the report of</p> <p>3 Professor Milgrom?</p> <p>4 A. Yes.</p> <p>5 Q. Were any of the other reports that you</p> <p>6 reviewed in connection with your preparation for</p> <p>7 this deposition -- sorry. Strike that.</p> <p>8 Was another of your reports you reviewed</p> <p>9 in preparation of this deposition that of</p> <p>10 Professor Jacob Hochstetler?</p> <p>11 A. Yes.</p> <p>12 Q. And those reports that are identified in</p> <p>13 appendix A of your report as being materials</p> <p>14 that you relied upon; is that correct?</p> <p>15 MR. HILLEGAS: Objection; form.</p> <p>16 THE WITNESS: Those are two reports</p> <p>17 I relied upon.</p> <p>18 BY MR. STEINTHAL:</p> <p>19 Q. Other than those two reports, did you</p> <p>20 review any other expert reports in this case?</p> <p>21 MR. HILLEGAS: Objection; form.</p> <p>22 THE WITNESS: I also looked at the</p> <p>23 report of Professor Rinard.</p> <p>24 BY MR. STEINTHAL:</p> <p>25 Q. Did you meet with -- without revealing</p>	<p style="text-align: right;">Page 60</p> <p>1 with counsel in preparing for this deposition;</p> <p>2 is that six?</p> <p>3 MR. HILLEGAS: Same objection, same</p> <p>4 caution.</p> <p>5 THE WITNESS: Yes.</p> <p>6 BY MR. STEINTHAL:</p> <p>7 Q. And to the extent you recall, do you have</p> <p>8 a sense of the total number of hours involved in</p> <p>9 those six meetings?</p> <p>10 MR. HILLEGAS: Objection to form.</p> <p>11 Under the expert stipulation, the total number</p> <p>12 of hours that we worked on this case may be</p> <p>13 disclosed but can not be break down per hour.</p> <p>14 Thereof instruct the witness not to</p> <p>15 answer as to any portion of hours prepared for</p> <p>16 the deposition today.</p> <p>17 BY MR. STEINTHAL:</p> <p>18 Q. Was anyone other than counsel to the</p> <p>19 plaintiffs and you present during those</p> <p>20 meetings?</p> <p>21 MR. HILLEGAS: Objection; form,</p> <p>22 privileged.</p> <p>23 You may answer yes or no to the</p> <p>24 extent that you know.</p> <p>25 THE WITNESS: No.</p>
<p style="text-align: right;">Page 59</p> <p>1 the substance of any communications, did you</p> <p>2 meet with counsel to prepare for this</p> <p>3 deposition?</p> <p>4 MR. HILLEGAS: Objection; form,</p> <p>5 privileged.</p> <p>6 You may answer the question yes or</p> <p>7 no.</p> <p>8 THE WITNESS: Yes.</p> <p>9 BY MR. STEINTHAL:</p> <p>10 Q. And approximately how many times did you</p> <p>11 meet with counsel in preparation for this</p> <p>12 report? For this deposition? Sorry.</p> <p>13 MR. HILLEGAS: Objection to form and</p> <p>14 privilege.</p> <p>15 (Inaudible) to any communications</p> <p>16 you may have had with counsel, but to the extent</p> <p>17 a number is coming to mind, you may provide a</p> <p>18 number.</p> <p>19 THE WITNESS: Approximately six</p> <p>20 times.</p> <p>21 BY MR. STEINTHAL:</p> <p>22 Q. Okay. And just to -- I'm going to repeat</p> <p>23 the question because I was little unclear in</p> <p>24 phrasing it last time.</p> <p>25 Approximately how many times did you meet</p>	<p style="text-align: right;">Page 61</p> <p>1 BY MR. STEINTHAL:</p> <p>2 Q. Did you select all the documents that you</p> <p>3 reviewed in preparation for this deposition?</p> <p>4 MR. HILLEGAS: Objection; form,</p> <p>5 privilege.</p> <p>6 You may answer yes or no to the</p> <p>7 extent that you know.</p> <p>8 THE WITNESS: Yes.</p> <p>9 BY MR. STEINTHAL:</p> <p>10 Q. And any other documents that you reviewed</p> <p>11 privy to -- strike that.</p> <p>12 And are any of the documents that you</p> <p>13 reviewed in preparation of this deposition other</p> <p>14 than report of Professor Rinard not listed on</p> <p>15 appendix A, materials relied upon in this case?</p> <p>16 MR. HILLEGAS: Objection; form.</p> <p>17 THE WITNESS: There are no other</p> <p>18 documents.</p> <p>19 MR. STEINTHAL: We can take a break.</p> <p>20 Go off the record.</p> <p>21 THE VIDEOGRAPHER: We are going off</p> <p>22 the record at 10:35 a.m.</p> <p>23 (Off-the-record discussion was held.)</p> <p>24 THE VIDEOGRAPHER: We're going back</p> <p>25 on the record at 10:52 a.m.</p>

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<p style="text-align: right;">Page 62</p> <p>1 BY MR. STEINTHAL:</p> <p>2 Q. Good morning, Professor. Just before we</p> <p>3 go back into questioning, is there anything that</p> <p>4 having had a few minutes to think that you want</p> <p>5 to correct from earlier testimony? Any issues</p> <p>6 that came to mind?</p> <p>7 A. Not at this time.</p> <p>8 Q. Okay. Thanks. Okay. So we previously</p> <p>9 established that Exhibit 1 is your report in</p> <p>10 this matter; is that correct?</p> <p>11 A. Yes.</p> <p>12 Q. And approximately when did you start</p> <p>13 working on drafting this report?</p> <p>14 MR. HILLEGAS: I'm just going to</p> <p>15 caution the witness under the terms of the</p> <p>16 expert stipulation, you can give a date. Don't</p> <p>17 disclose the context of any drafting that you</p> <p>18 may have done.</p> <p>19 THE WITNESS: Report -- work on the</p> <p>20 report itself as opposed background was in</p> <p>21 August.</p> <p>22 BY MR. STEINTHAL:</p> <p>23 Q. And when you say background, without</p> <p>24 revealing the contents of any drafts, can you</p> <p>25 give me a sense of what you mean by the term</p>	<p style="text-align: right;">Page 64</p> <p>1 architectural level and understand how the</p> <p>2 source code was organized and what -- you know,</p> <p>3 how -- how -- what functionality was there.</p> <p>4 That -- that review was before</p> <p>5 Dr. Milgrom's report was available.</p> <p>6 BY MR. STEINTHAL:</p> <p>7 Q. Were you trying to answer any specific</p> <p>8 substantive questions at that point?</p> <p>9 MR. HILLEGAS: Objection; form.</p> <p>10 THE WITNESS: A specific question,</p> <p>11 no.</p> <p>12 BY MR. STEINTHAL:</p> <p>13 Q. Did -- strike that.</p> <p>14 If we turn to paragraph two of your</p> <p>15 report, does that -- that accurately describe</p> <p>16 your assignment in this case?</p> <p>17 A. Paragraph two does.</p> <p>18 Q. And without revealing the substance of</p> <p>19 any communications that you may have had with</p> <p>20 counsel, has that assignment changed at any</p> <p>21 point over the course of your engagement?</p> <p>22 MR. HILLEGAS: Objection; form.</p> <p>23 THE WITNESS: No.</p> <p>24 BY MR. STEINTHAL:</p> <p>25 Q. Again without reveal the substance of any</p>
<p style="text-align: right;">Page 63</p> <p>1 background?</p> <p>2 MR. HILLEGAS: Same objections and</p> <p>3 cautions to the witness.</p> <p>4 THE WITNESS: This report is</p> <p>5 responding to Dr. -- you know, rebutting</p> <p>6 Dr. Milgrom's report, and so the drafting</p> <p>7 began -- the full drafting began after we</p> <p>8 received Dr. Milgrom's report, but preparation</p> <p>9 for was before that.</p> <p>10 BY MR. STEINTHAL:</p> <p>11 Q. And during that phase you're describing</p> <p>12 as preparation, had you begun to formulate the</p> <p>13 opinions that were eventually included in your</p> <p>14 report?</p> <p>15 A. I -- I had begun under -- trying to</p> <p>16 understand Google's ad infracture, which was</p> <p>17 then used to inform the opinion I presented</p> <p>18 here.</p> <p>19 Q. And when you began to understand Google's</p> <p>20 ad infrastructure, did you have a goal in mind</p> <p>21 as to the aspect of the infrastructure that you</p> <p>22 were trying to understand?</p> <p>23 MR. HILLEGAS: Objection; form.</p> <p>24 THE WITNESS: I was trying to</p> <p>25 understand how the overall system worked at an</p>	<p style="text-align: right;">Page 65</p> <p>1 communications you might have had with counsel,</p> <p>2 who provided the assignment to you for this</p> <p>3 case?</p> <p>4 MR. HILLEGAS: Objection; form.</p> <p>5 THE WITNESS: I was asked by</p> <p>6 counsel.</p> <p>7 BY MR. STEINTHAL:</p> <p>8 Q. The opinion -- sorry. The assignment</p> <p>9 that you list is to respond to the opinion of</p> <p>10 Dr. Milgrom that advertisement publishers are</p> <p>11 able to optimize their behavior in response to</p> <p>12 modifications that Google enters into the</p> <p>13 auction programs, correct?</p> <p>14 MR. HILLEGAS: Objection; form.</p> <p>15 THE WITNESS: It was -- the</p> <p>16 assignment was to -- you know, was to offer an</p> <p>17 opinion on the degree to which, you know,</p> <p>18 advertisement publishers can optimize the</p> <p>19 behavior response to modifications that Google</p> <p>20 introduces to its auction programs.</p> <p>21 BY MR. STEINTHAL:</p> <p>22 Q. And without revealing the substance of</p> <p>23 any communications you may have had with</p> <p>24 counsel, when counsel gave you this assignment</p> <p>25 in this case, was it limited to the particular</p>

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<p style="text-align: right;">Page 66</p> <p>1 opinion that's listed in paragraph two or was it 2 more general? 3 MR. HILLEGAS: Objection; form. 4 THE WITNESS: My opinion was to be 5 specific to rebutting Dr. Milgrom's statement. 6 BY MR. STEINTHAL: 7 Q. And just to be precise, it was to rebut 8 the particular statement of Dr. Milgrom that 9 referenced in paragraph two rather than 10 Dr. Milgrom more generally? 11 A. It's -- 12 MR. HILLEGAS: Objection; form. 13 THE WITNESS: Paragraph two doesn't 14 actually quote Dr. Milgrom. I quote him later 15 in my report. But at a high level this covers 16 the aspect of Dr. Milgrom's report I was 17 responding to. 18 BY MR. STEINTHAL: 19 Q. And at that high level -- and we'll get 20 into the detail in a little bit -- was counsel 21 responsible for selecting those opinions of 22 Dr. Milgrom that you were responding to? 23 A. Yes. 24 Q. Okay. Having received that assignment, 25 what led you to focus on information advantage,</p>	<p style="text-align: right;">Page 68</p> <p>1 is saying that outsiders can -- you know, 2 outsiders of Google can understand what's 3 happening inside of Google by conducting 4 experiments. 5 And I have looked at Google's 6 infrastructure, and I was going, there's a lot 7 going on in there. So -- so then the question 8 was, given all that's going on in there, how 9 much transparency is there of that to outsiders? 10 What information is given to outsiders versus 11 what information is given insiders, because 12 given how complex that system is, the only way 13 outsiders could understand what was going on is 14 if they have full disclosure. And so I could 15 look at the code and go, well, how much is being 16 told? And that's where I started looking. 17 Q. Is it your understanding that Dr. Milgrom 18 offered an opinion that outsiders can understand 19 what's happening inside of Google algorithms? 20 MR. HILLEGAS: Objection; form. 21 THE WITNESS: I give a summary of my 22 understanding of what Dr. Milgrom said in 23 paragraph 19. I can read this if you -- 24 BY MR. STEINTHAL: 25 Q. My question was more specific.</p>
<p style="text-align: right;">Page 67</p> <p>1 information and balance as a way of answering 2 the question? 3 A. What led me is I describe my -- the -- 4 the process, you know, what my reasoning mostly 5 in paragraph 19, 20 and 21, how I get to 6 information advantage from that. And so that -- 7 it's really about understanding what does it 8 mean to do an experiment and understand the 9 results of it and then thinking about that in 10 the context of my understanding of Google's ad 11 infrastructure. 12 Q. There might be multiple different ways of 13 responding to Professor Milgrom's opinion 14 regarding the ability of advertisement 15 publishers to optimize; is that correct? 16 MR. HILLEGAS: Objection; form. 17 THE WITNESS: I imagine there's 18 other arguments that could be made. 19 BY MR. STEINTHAL: 20 Q. And my question was: From among those 21 different arguments or lines of inquiry, what 22 led you to believe that information advantage 23 was a fruitful way of approaching the question? 24 A. So this gets my background on trying to 25 understand complex systems is that Dr. Milgrom</p>	<p style="text-align: right;">Page 69</p> <p>1 Is it your understanding that Dr. Milgrom 2 offered an opinion that outsiders can understand 3 the operation of Google's relevant algorithms? 4 MR. HILLEGAS: Objection; form. 5 THE WITNESS: Specifically what 6 Dr. -- as I understand what Dr. Milgrom was 7 saying was that advertisement publishers 8 regularly conduct experiments in ad markets; 9 those being outside of Google. And that -- and 10 Google offers features to facilitate those 11 experiments, and implied, you know, in what 12 Dr. Milgrom said is that those experiments are 13 sufficient to understand what's happening inside 14 of Google. 15 BY MR. STEINTHAL: 16 Q. We'll come back to that. 17 A. Okay. 18 Q. As part of preparing your report, you 19 reviewed expert report of Professor Milgrom 20 dated July 30th, 2024; is that correct? 21 MR. HILLEGAS: Objection, form. 22 THE WITNESS: I reviewed the expert 23 report of Dr. Milgrom. I do not recall the 24 date. 25 BY MR. STEINTHAL:</p>

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<p style="text-align: right;">Page 70</p> <p>1 Q. But it was the report that it was 2 submitted in this case pending in Eastern 3 District of Texas? 4 A. Yes. 5 Q. Did you review any other reports from 6 Professor Milgrom as part of your work on this 7 case? 8 A. I only reviewed one report from 9 Dr. Milgrom. 10 Q. So if I turn to the appendix B of your 11 report on page 32, second half of the page, line 12 17, there's a reference to an expert report of 13 Professor Milgrom dated January 23rd, 2024. Do 14 you see that? 15 A. Yes, I do. 16 Q. You did not review that report? 17 A. No, I did not. 18 Q. Did you otherwise consider that report? 19 A. These are all on the reports that are 20 listed and materials that I considered, so it 21 was considered in the sense of things that I 22 searched through potentially but not things that 23 I relied upon. 24 Q. I see. So you -- you may have run tech 25 searches otherwise that could have pulled up</p>	<p style="text-align: right;">Page 72</p> <p>1 in depth. 2 Q. But you read it sufficiently to have an 3 understanding that -- of its context that you 4 were going to respond to; is that correct? 5 MR. HILLEGAS: Objection; form. 6 THE WITNESS: I wasn't responding to 7 those portions of the report, so... 8 BY MR. STEINTHAL: 9 Q. But just to be clear, the portions -- the 10 opinions you were responding to, you believe you 11 read it adequately to have a sufficient 12 understanding of the report to respond? 13 A. Yes. 14 Q. You also -- so returning to back to 15 paragraph three of your report, you say that you 16 considered the report of Dr. Rinard, and I 17 believe you also said you -- you testified 18 earlier that you reviewed that in preparation of 19 this deposition; is that correct? 20 MR. HILLEGAS: Objection; form. 21 THE WITNESS: I did consider it in 22 for writing my report and I did review it 23 before. 24 BY MR. STEINTHAL: 25 Q. And did you read that report from -- in a</p>
<p style="text-align: right;">Page 71</p> <p>1 material from this report, but you did not read 2 it cover to cover? 3 A. Exactly. 4 Q. To your recollection, did any of the 5 searches that you ran lead you to material in 6 this report that you did, in fact, review 7 portions of this report from January 2024? 8 MR. HILLEGAS: Objection; form. 9 THE WITNESS: Not that I recall. 10 BY MR. STEINTHAL: 11 Q. Okay. And by contrast, when you say that 12 you did review the report of Professor Milgrom 13 in this case, you mean to testify that you did 14 read it linearly; is that correct? 15 MR. HILLEGAS: Objection; form. 16 THE WITNESS: I did. 17 BY MR. STEINTHAL: 18 Q. And did you read it in its entirety? 19 A. I did read it. 20 Q. In its entirety? 21 A. I -- I read certain -- I read the 22 portions that I focused on regarding the 23 experiments in detail. The other parts -- the 24 majority of the report which was about 25 economics, I looked at it, but I didn't read it</p>	<p style="text-align: right;">Page 73</p> <p>1 linear fashion? 2 MR. HILLEGAS: Objection; form. 3 THE WITNESS: I looked through the 4 report. You know, linear is not typically how I 5 would approach this sort of problem. 6 BY MR. STEINTHAL: 7 Q. Ask the question a little differently. 8 You had distinguished between Professor 9 Milgrom's report, which you read the relevant 10 portions of, and Professor Milgrom's earlier 11 report and the others in appendix B, which were 12 part of reports that you searched. 13 Would you put Professor Rinard's report 14 in the first category that you read or in the 15 second category that you just merely searched 16 through? 17 MR. HILLEGAS: Objection; form. 18 THE WITNESS: For the deposition 19 preparation, I put it in the category that I 20 read. 21 BY MR. STEINTHAL: 22 Q. Okay. But when you were preparing the 23 report, did you read it or just search it? 24 A. That was more search. 25 Q. Did you -- as part of your work in</p>

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<p style="text-align: right;">Page 74</p> <p>1 forming this report -- in formulating your 2 report, did you form any opinions as of 3 substance of Professor Rinard's opinions? 4 MR. HILLEGAS: Objection; form. 5 THE WITNESS: I did not offer any 6 expert opinions regarding Professor Rinard's 7 report. 8 BY MR. STEINTHAL: 9 Q. And, in fact, Professor Milgrom is the 10 only expert you're purporting to respond to in 11 this case; is that correct? 12 A. Yes. 13 MR. HILLEGAS: Objection; form. 14 THE WITNESS: Yes. 15 BY MR. STEINTHAL: 16 Q. So thinking more generally about the 17 materials that you reviewed or searched through 18 in preparation for your report and forming your 19 opinions and drafting the report, did you select 20 the materials that you reviewed in that context? 21 MR. HILLEGAS: Objection; form. 22 THE WITNESS: Yes. 23 BY MR. STEINTHAL: 24 Q. And you were responsible for determining 25 which documents you wanted to read in their</p>	<p style="text-align: right;">Page 76</p> <p>1 Q. Do you recall reviewing deposition 2 transcripts -- 3 A. Oh. 4 Q. Sorry. 5 A. Oh, I don't recall relying much on 6 deposition transcripts, but I would refer to my 7 report to see which ones were actually ones I 8 relied upon. 9 Q. If there are none, does that indicate you 10 didn't review any of the substance? 11 A. Yes. 12 MR. HILLEGAS: Objection; form, but 13 answered. 14 BY MR. STEINTHAL: 15 Q. Are there any materials or documents that 16 you relied upon to form the opinions in your 17 report that are not listed or cited in appendix 18 A to your report? 19 A. No. Well, except for the errata that we 20 have. 21 Q. I thought the errata -- 22 A. Sorry. That was about the considered, 23 not relied. 24 Q. Just to clarify the record again, are 25 there any documents or other materials that you</p>
<p style="text-align: right;">Page 75</p> <p>1 entirety versus those you just wanted to search 2 through? 3 A. Yes. 4 Q. Without revealing the substance of any 5 communications, did anyone other than you select 6 materials for you to review in preparation for 7 your report? 8 MR. HILLEGAS: Objection; form. 9 And caution the witness not to 10 disclose any communications or names, but you 11 may answer the question yes or no to the extent 12 that you know. 13 THE WITNESS: No. 14 BY MR. STEINTHAL: 15 Q. So to the extent that you reviewed 16 documents produced by Google, you selected them? 17 MR. HILLEGAS: Objection; form. 18 THE WITNESS: I chose the documents 19 that I reviewed. 20 BY MR. STEINTHAL: 21 Q. And the same is true for deposition 22 transcripts? 23 MR. HILLEGAS: Objection; form. 24 THE WITNESS: Yes. 25 BY MR. STEINTHAL:</p>	<p style="text-align: right;">Page 77</p> <p>1 relied upon to form the opinions in your report 2 that are not listed or cited in appendix A? 3 A. No. 4 MR. HILLEGAS: Objection; form. 5 THE WITNESS: No. 6 BY MR. STEINTHAL: 7 Q. And that would include any deposition or 8 trial testimony? 9 MR. HILLEGAS: Objection; form. 10 THE WITNESS: Correct. 11 BY MR. STEINTHAL: 12 Q. Okay. In paragraph four of your report, 13 you state that your opinions were based on in 14 part, quote, "the materials briefed to me by 15 counsel." What materials are those? 16 A. In this context, my -- my understanding 17 of the materials, when I said briefed, it's just 18 saying that were made available to me. So it's 19 referring to the corpus of documents that are 20 private that are in the materials considered. 21 Q. I see. And to your knowledge, there are 22 no such materials that are not listed in 23 appendix B with the caveats -- the corrections 24 we already made? 25 MR. HILLEGAS: Objection; form.</p>

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<p style="text-align: right;">Page 78</p> <p>1 THE WITNESS: Yes.</p> <p>2 BY MR. STEINTHAL:</p> <p>3 Q. Were there any materials that you wanted</p> <p>4 to review in this case but were unable to for</p> <p>5 some reason?</p> <p>6 MR. HILLEGAS: Objection; form.</p> <p>7 THE WITNESS: The materials I had</p> <p>8 available to me were sufficient to draw the</p> <p>9 conclusions that I did.</p> <p>10 BY MR. STEINTHAL:</p> <p>11 Q. So turn to paragraph four or, I guess,</p> <p>12 staying in paragraph four -- that's the last one</p> <p>13 we looked at -- you say that your opinion was</p> <p>14 based -- is based on my review of the source</p> <p>15 code and documents available to me at the time</p> <p>16 this report was published. Do you see that?</p> <p>17 MR. HILLEGAS: Objection; form.</p> <p>18 THE WITNESS: Yes.</p> <p>19 BY MR. STEINTHAL:</p> <p>20 Q. And with respect to the documents you had</p> <p>21 available to you, you had access to all the</p> <p>22 third-party documents produced in this case; is</p> <p>23 that correct?</p> <p>24 MR. HILLEGAS: Objection; form.</p> <p>25 THE WITNESS: To the best of my</p>	<p style="text-align: right;">Page 80</p> <p>1 relied on this case; is that correct?</p> <p>2 MR. HILLEGAS: Objection; form.</p> <p>3 THE WITNESS: Not to my knowledge.</p> <p>4 BY MR. STEINTHAL:</p> <p>5 Q. And you did not rely on any deposition</p> <p>6 transcripts in preparing your opinions; is that</p> <p>7 correct?</p> <p>8 MR. HILLEGAS: Objection; form.</p> <p>9 THE WITNESS: No.</p> <p>10 BY MR. STEINTHAL:</p> <p>11 Q. And is that because you did not believe</p> <p>12 that those deposition transcripts provided</p> <p>13 information that was relevant to your analysis?</p> <p>14 MR. HILLEGAS: Objection; form.</p> <p>15 THE WITNESS: The information that I</p> <p>16 relied upon was sufficient to reach the</p> <p>17 questions that I did. There was lots more</p> <p>18 information. Some of that could have been</p> <p>19 useful, but none of it should have contradicted</p> <p>20 anything that I relied upon.</p> <p>21 BY MR. STEINTHAL:</p> <p>22 Q. How do you know that none of the --</p> <p>23 strike that.</p> <p>24 What, if any, work did you do to</p> <p>25 determine whether any of the materials that were</p>
<p style="text-align: right;">Page 79</p> <p>1 knowledge, yes.</p> <p>2 BY MR. STEINTHAL:</p> <p>3 Q. And to the best of your knowledge, you</p> <p>4 had access to all of the deposition transcripts</p> <p>5 in this case; is that correct?</p> <p>6 MR. HILLEGAS: Objection; form.</p> <p>7 THE WITNESS: To the best of my</p> <p>8 knowledge, yes.</p> <p>9 BY MR. STEINTHAL:</p> <p>10 Q. To the best of your knowledge, did you</p> <p>11 also have access to all the third-party data</p> <p>12 production in this case?</p> <p>13 MR. HILLEGAS: Objection; form.</p> <p>14 THE WITNESS: To the best of my</p> <p>15 knowledge, yes.</p> <p>16 BY MR. STEINTHAL:</p> <p>17 Q. But did you not rely on any documents</p> <p>18 produced by anyone other than Google in this</p> <p>19 case; is that correct?</p> <p>20 A. I relied on the documents produced by</p> <p>21 Google and some public sources that as I cite</p> <p>22 them.</p> <p>23 Q. But none of the documents that were</p> <p>24 produced in this case pursuant to subpoenas by</p> <p>25 third parties other than Google are documents</p>	<p style="text-align: right;">Page 81</p> <p>1 available to you but that you did not rely upon</p> <p>2 would not have contradicted the opinions in your</p> <p>3 report?</p> <p>4 A. My opinions were about the source code</p> <p>5 fundamentally with the documents supporting it,</p> <p>6 and so I looked at the source code, and so I</p> <p>7 got, in a sense, ground truth from that, and so</p> <p>8 much of the other information was -- was about</p> <p>9 it but not the code.</p> <p>10 Q. Okay. Did you review or consider any</p> <p>11 quantitative data as part of your work in this</p> <p>12 case?</p> <p>13 MR. HILLEGAS: Objection; form.</p> <p>14 THE WITNESS: I did not.</p> <p>15 BY MR. STEINTHAL:</p> <p>16 Q. And again that's because did you not</p> <p>17 believe that they were relevant to forming the</p> <p>18 opinions that you have in your report?</p> <p>19 MR. HILLEGAS: Objection; form.</p> <p>20 THE WITNESS: I didn't believe they</p> <p>21 were necessary in order to form the opinions I</p> <p>22 had in this report.</p> <p>23 BY MR. STEINTHAL:</p> <p>24 Q. So as we discussed, as part of your</p> <p>25 analysis of this case, you reviewed Google</p>

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<p style="text-align: right;">Page 82</p> <p>1 source code; is that correct?</p> <p>2 A. Yes.</p> <p>3 Q. How would you describe what you were</p> <p>4 hoping to the accomplish when you started that</p> <p>5 review?</p> <p>6 A. When I started my review, before I had my</p> <p>7 specific assignment, I was just trying to</p> <p>8 understand the architecture of the system and</p> <p>9 how -- how things fit together. When you start</p> <p>10 with a large code base, there's a lot of just</p> <p>11 trying to figure out which direction is up. It</p> <p>12 can be very confusing, so just getting familiar</p> <p>13 with the key structures of it and how it was</p> <p>14 organized took some time.</p> <p>15 Q. And sorry, is that end of your answer?</p> <p>16 A. I'm -- I'm not sure if that responded to</p> <p>17 your question completely, but...</p> <p>18 Q. In your last response, you refer to the</p> <p>19 time before you had your specific assignment.</p> <p>20 What is that point when you had your specific</p> <p>21 assignment approximately?</p> <p>22 MR. HILLEGAS: Objection; form.</p> <p>23 Not disclose -- caution the witness</p> <p>24 not to disclose any communications that you had</p> <p>25 with counsel.</p>	<p style="text-align: right;">Page 84</p> <p>1 BY MR. STEINTHAL:</p> <p>2 Q. And is it fair to say that your opinions</p> <p>3 in this case are limited to the operation of</p> <p>4 Google's source code?</p> <p>5 MR. HILLEGAS: Objection; form.</p> <p>6 THE WITNESS: My opinions in this</p> <p>7 case are about my understanding of the -- of the</p> <p>8 software system as embodied, you know, in that</p> <p>9 code. So operations -- I'm not sure exactly how</p> <p>10 to apply the term operation.</p> <p>11 BY MR. STEINTHAL:</p> <p>12 Q. You testified that you're -- strike that.</p> <p>13 You said earlier that you were not</p> <p>14 concerned that third-party documents or</p> <p>15 testimony would contradict your opinions because</p> <p>16 your opinions were primarily about the nature of</p> <p>17 Google systems; is that correct?</p> <p>18 MR. HILLEGAS: Objection; form.</p> <p>19 THE WITNESS: I was trying to</p> <p>20 understand the systems by understanding the</p> <p>21 code. And so documents supported my</p> <p>22 understanding of the code, and so once I</p> <p>23 understood what was going on, I could draw</p> <p>24 conclusions. Other documents could have told me</p> <p>25 additional things about the code, but I had</p>
<p style="text-align: right;">Page 83</p> <p>1 THE WITNESS: Early on.</p> <p>2 BY MR. STEINTHAL:</p> <p>3 Q. And at that point and subsequent to it,</p> <p>4 what were you hoping to accomplish with your</p> <p>5 review of Google source code?</p> <p>6 MR. HILLEGAS: Objection; form.</p> <p>7 THE WITNESS: My goal was to</p> <p>8 understand the degree of information balance or</p> <p>9 imbalance between first-party and third-party</p> <p>10 participants in the Google ad ecosystem.</p> <p>11 BY MR. STEINTHAL:</p> <p>12 Q. About how long would you say you spent</p> <p>13 reviewing Google's source code in this matter?</p> <p>14 MR. HILLEGAS: Objection; form. In</p> <p>15 terms of the expert stipulation, I caution the</p> <p>16 witness on the form that the number of hours</p> <p>17 spent is not in the source code, and it's not</p> <p>18 discoverable, and I'll instruct him not to</p> <p>19 answer the question.</p> <p>20 BY MR. STEINTHAL:</p> <p>21 Q. Was your review of Google source code, in</p> <p>22 your mind, sufficient to achieve the goals you</p> <p>23 set out to do when you began that review?</p> <p>24 MR. HILLEGAS: Objection; form.</p> <p>25 THE WITNESS: Yes.</p>	<p style="text-align: right;">Page 85</p> <p>1 achieved sufficient understanding of the code.</p> <p>2 BY MR. STEINTHAL:</p> <p>3 Q. And the conclusions that you drew, were</p> <p>4 they related exclusively to Google's systems at</p> <p>5 issue?</p> <p>6 MR. HILLEGAS: Objection; form.</p> <p>7 THE WITNESS: I cannot say whether</p> <p>8 the conclusions I drew might have further, you</p> <p>9 know, utility or implications in other context.</p> <p>10 I can just say what I observed.</p> <p>11 BY MR. STEINTHAL:</p> <p>12 Q. But your testimony in this case is</p> <p>13 limited to, as you just said, what you observed</p> <p>14 through your review of the code and relevant</p> <p>15 documents about Google systems?</p> <p>16 A. Yes.</p> <p>17 MR. HILLEGAS: Objection; form.</p> <p>18 BY MR. STEINTHAL:</p> <p>19 Q. We talked earlier about how distributed</p> <p>20 complex systems involve the interaction of</p> <p>21 multiple parties with -- with systems; do you</p> <p>22 recall that?</p> <p>23 A. Yes.</p> <p>24 Q. And some of the parties who interact with</p> <p>25 Google's systems at issue in this case are</p>

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<p style="text-align: right;">Page 86</p> <p>1 publishers and advertisers; is that correct?</p> <p>2 A. Yes.</p> <p>3 Q. And also bidding tools or other ad tech</p> <p>4 products that they may use; is that correct?</p> <p>5 A. Those other tools would interface with it</p> <p>6 [REDACTED]</p> <p>8 Q. Correct. So the question I was asking</p> <p>9 was: If we were trying to identify the</p> <p>10 different participants or stakeholders who</p> <p>11 interact with Google systems, that might include</p> <p>12 advertisers, publishers, and also the software</p> <p>13 systems, the provider software systems, that</p> <p>14 those advertisers might use; is that correct?</p> <p>15 MR. HILLEGAS: Objection; form.</p> <p>16 THE WITNESS: That was a list of the</p> <p>17 parties that could be interacting through the</p> <p>18 system. [REDACTED]</p> <p>21 BY MR. STEINTHAL:</p> <p>22 Q. But if you're trying -- but you</p> <p>23 identified that one of the -- one of the</p> <p>24 characters for the complex system that you</p> <p>25 analyzed in your work is that it has to deal</p>	<p style="text-align: right;">Page 88</p> <p>1 would say, fundamental to making the system what</p> <p>2 it is in terms of being a complex system.</p> <p>3 BY MR. STEINTHAL:</p> <p>4 Q. Did you as part of your work on this case</p> <p>5 analyze any software systems that interact with</p> <p>6 Google system other than Google system itself?</p> <p>7 A. My review was limited to the source code,</p> <p>8 the Google source code.</p> <p>9 Q. So you did not review the source code</p> <p>10 with any non-Google ad tech tools in this case,</p> <p>11 correct?</p> <p>12 MR. HILLEGAS: Objection; form.</p> <p>13 THE WITNESS: I did not review</p> <p>14 source code from any other source in this case.</p> <p>15 BY MR. STEINTHAL:</p> <p>16 Q. And looking back before your work on this</p> <p>17 case, have you ever, to your knowledge, examined</p> <p>18 the source code of any ad tech provider other</p> <p>19 than Google?</p> <p>20 MR. HILLEGAS: Objection; form.</p> <p>21 THE WITNESS: I have not.</p> <p>22 BY MR. STEINTHAL:</p> <p>23 Q. In the context of this case, did you do</p> <p>24 any work to understand how any non-Google ad</p> <p>25 tech tools operate?</p>
<p style="text-align: right;">Page 87</p> <p>1 with and interact with multiple different, sort</p> <p>2 of, outside influences and parties; is that</p> <p>3 correct?</p> <p>4 MR. HILLEGAS: Objection; form.</p> <p>5 THE WITNESS: Yes.</p> <p>6 BY MR. STEINTHAL:</p> <p>7 Q. And in fact, that's why we had a little</p> <p>8 discussion earlier about whether AlphaFold</p> <p>9 qualified or not. You said it was mostly</p> <p>10 self-contained, and so therefore it was less</p> <p>11 complex than the systems that you were talking</p> <p>12 about; is that correct?</p> <p>13 MR. HILLEGAS: Objection; form.</p> <p>14 THE WITNESS: Yes.</p> <p>15 BY MR. STEINTHAL:</p> <p>16 Q. So my question is: If we were trying to</p> <p>17 identify the many various parties and systems</p> <p>18 that interact with Google system to make it as</p> <p>19 complex as you say it is, those would include</p> <p>20 not just advertisers and publishers but also</p> <p>21 other software tools that advertisers might use;</p> <p>22 is that correct?</p> <p>23 MR. HILLEGAS: Objection; form.</p> <p>24 THE WITNESS: Those other tools</p> <p>25 might interact with a system, but they aren't, I</p>	<p style="text-align: right;">Page 89</p> <p>1 MR. HILLEGAS: Objection; form.</p> <p>2 THE WITNESS: I did not.</p> <p>3 BY MR. STEINTHAL:</p> <p>4 Q. And do you recall ever having done that</p> <p>5 analysis in any context other than this case?</p> <p>6 MR. HILLEGAS: Objection; form.</p> <p>7 THE WITNESS: I have not -- I have</p> <p>8 not analyzed advertising system code outside the</p> <p>9 context of this case previously.</p> <p>10 BY MR. STEINTHAL:</p> <p>11 Q. Have you done any work to understand how</p> <p>12 advertising technology systems operate other</p> <p>13 than through their view source code? So one</p> <p>14 might -- you might have studied how a</p> <p>15 third-party system worked through some mechanism</p> <p>16 other than source code. What I'm trying to</p> <p>17 understand is, are you limiting your testimony?</p> <p>18 MR. HILLEGAS: Objection; form.</p> <p>19 THE WITNESS: I have to studied web</p> <p>20 applications, web ecosystems, and as part of</p> <p>21 that, I've studied interactions with different</p> <p>22 parties inside the context of a web page.</p> <p>23 There is a paper I have on content</p> <p>24 provider conflict on the modern web, and part of</p> <p>25 that was understanding how other parties</p>

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<p style="text-align: right;">Page 90</p> <p>1 including advertisers would interact in the</p> <p>2 context of a web page and how their code could</p> <p>3 come into conflict, where they could potentially</p> <p>4 spy on each other or modify each other's</p> <p>5 behavior inside of a web page.</p> <p>6 So I have thought about the</p> <p>7 technology and the interactions in -- in that</p> <p>8 sort of context. I don't -- but that is</p> <p>9 separate from this case.</p> <p>10 BY MR. STEINTHAL:</p> <p>11 Q. Have you done any analysis of how</p> <p>12 advertisers can use buying tools to automate or</p> <p>13 improve their bidding strategies in ad auctions?</p> <p>14 MR. HILLEGAS: Objection; form.</p> <p>15 THE WITNESS: No.</p> <p>16 BY MR. STEINTHAL:</p> <p>17 Q. You have analyzed how publishers can use</p> <p>18 ad tech tools to automatic or improve their ad</p> <p>19 sales?</p> <p>20 MR. HILLEGAS: Objection; form.</p> <p>21 THE WITNESS: I have not analyzed</p> <p>22 how advertise -- sorry.</p> <p>23 I have not analyzed systems other</p> <p>24 than Google's with relation to advertising</p> <p>25 technology.</p>	<p style="text-align: right;">Page 92</p> <p>1 Q. Have you analyzed how publishers might</p> <p>2 use ad tech tools to serve ads on their web</p> <p>3 pages or other mobile properties or other</p> <p>4 properties?</p> <p>5 MR. HILLEGAS: Objection; form.</p> <p>6 THE WITNESS: I have not analyzed</p> <p>7 the tools themselves, but in the context of</p> <p>8 looking at Google source code, I have, you know,</p> <p>9 thought about their ability to optimize systems.</p> <p>10 BY MR. STEINTHAL:</p> <p>11 Q. Did you speak with any advertisers or</p> <p>12 publishers or their employees in the course of</p> <p>13 developing your opinions in this case?</p> <p>14 MR. HILLEGAS: Objection; form.</p> <p>15 THE WITNESS: I have not.</p> <p>16 BY MR. STEINTHAL:</p> <p>17 Q. Did you speak with or interview anyone</p> <p>18 who is knowledgeable about the operation or</p> <p>19 development of ad tech tools as part of your</p> <p>20 work in preparing for this case?</p> <p>21 MR. HILLEGAS: Objection; form.</p> <p>22 THE WITNESS: I did not interview</p> <p>23 anyone who is knowledgeable about the operation</p> <p>24 or development of ad tech tools as part of my</p> <p>25 work in preparing for this case.</p>
<p style="text-align: right;">Page 91</p> <p>1 BY MR. STEINTHAL:</p> <p>2 Q. Okay.</p> <p>3 A. Beyond -- beyond the general web</p> <p>4 technology that are lines on this.</p> <p>5 Q. Are you familiar with what the term</p> <p>6 publisher means in the context of this case?</p> <p>7 A. Yes.</p> <p>8 Q. It means company or entity that shows</p> <p>9 advertisements on its Web page; is that correct?</p> <p>10 Fair definition?</p> <p>11 MR. HILLEGAS: Objection; form.</p> <p>12 THE WITNESS: On its web pages</p> <p>13 online.</p> <p>14 BY MR. STEINTHAL:</p> <p>15 Q. Or mobile applications or other</p> <p>16 properties?</p> <p>17 A. Yes.</p> <p>18 MR. HILLEGAS: Objection; form.</p> <p>19 BY MR. STEINTHAL:</p> <p>20 Q. Have you analyzed how publishers can use</p> <p>21 ad tech tools to automate their ad sales?</p> <p>22 MR. HILLEGAS: Objection; form.</p> <p>23 THE WITNESS: I have not analyzed</p> <p>24 such automation systems directly.</p> <p>25 BY MR. STEINTHAL:</p>	<p style="text-align: right;">Page 93</p> <p>1 BY MR. STEINTHAL:</p> <p>2 Q. Did you conduct any interviews as part of</p> <p>3 your work in preparation of this case?</p> <p>4 A. I did not conduct any interviews as part</p> <p>5 of preparation for this case.</p> <p>6 Q. Without revealing the content of any</p> <p>7 conversations that you may have had, have you</p> <p>8 discussed this case or any of your opinions with</p> <p>9 any of the plaintiff's other experts in this</p> <p>10 case?</p> <p>11 A. No.</p> <p>12 Q. In paragraph four of your report, you say</p> <p>13 that you, quote, "reserve the right to</p> <p>14 supplement my report should any additional</p> <p>15 information be produced in this case as well to</p> <p>16 create and use graphics, figure, and other</p> <p>17 materials at trial to support my conclusions."</p> <p>18 Do you see that?</p> <p>19 MR. HILLEGAS: Objection; form.</p> <p>20 THE WITNESS: I do see that sentence</p> <p>21 in my report.</p> <p>22 BY MR. STEINTHAL:</p> <p>23 Q. Have you reviewed any other materials</p> <p>24 since submitting your rebuttal report that you</p> <p>25 had not previously reviewed while drafting it?</p>

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<p style="text-align: right;">Page 94</p> <p>1 A. I looked at Dr. Rinard's report that I 2 hadn't looked at in detail previously. I ran 3 through that but other than that, no. 4 Q. And that did not lead you to change any 5 opinions you had in your report? 6 A. It did not. 7 Q. Was there any additional analysis that 8 you hoped to take -- to undertake in this matter 9 that you did not do? 10 MR. HILLEGAS: Objection; form. 11 THE WITNESS: My analysis that I 12 conducted was sufficient for the conclusions 13 that I reached. 14 BY MR. STEINTHAL: 15 Q. Without revealing -- strike that. 16 Did counsel provide any assumptions to 17 you that you relied upon in forming the opinions 18 in your report? 19 MR. HILLEGAS: Objection; form. 20 Caution the witness not to disclose 21 any communications that you may have had with 22 counsel, but you may answer the question yes or 23 no. 24 THE WITNESS: No. 25 BY MR. STEINTHAL:</p>	<p style="text-align: right;">Page 96</p> <p>1 Milgrom's opinions were offered in his capacity 2 as an expert in market design; is that correct? 3 MR. HILLEGAS: Objection; form. 4 THE WITNESS: I can't speak to 5 Dr. Milgrom's precise expertise. I see -- I 6 understand that he is an expert in economics. 7 BY MR. STEINTHAL: 8 Q. Okay. And as you previously testified, 9 you are not an expert in economics, auction 10 theory, or market design; is that correct? 11 MR. HILLEGAS: Objection; form. 12 THE WITNESS: I am not an expert in 13 those areas. I have expertise relating to the 14 technology underlying, you know, online 15 advertising systems. 16 BY MR. STEINTHAL: 17 Q. Without revealing the substance of any 18 communications or conversations you may have 19 had, did you discuss Dr. Milgrom's opinions or 20 your understanding of them with anyone who is 21 trained or expert in economics, auction theory, 22 or market design? 23 MR. HILLEGAS: Objection; form, 24 privilege. 25 I'm going to instruct the witness</p>
<p style="text-align: right;">Page 95</p> <p>1 Q. Did counsel provide you any facts that 2 you relied upon in forming the opinions in your 3 report? 4 MR. HILLEGAS: Same objection, same 5 caution. 6 You may answer the question yes or 7 no. 8 THE WITNESS: No. 9 BY MR. STEINTHAL: 10 Q. So we discussed earlier that your 11 report -- opinions in this case are exclusively 12 responsive to those of Professor Milgrom; is 13 that correct? 14 MR. HILLEGAS: Objection; form. 15 THE WITNESS: My report is a 16 rebuttal to a -- you know, to a point that 17 Dr. Milgrom states. I can't say whether that's 18 of use elsewhere in the case. 19 BY MR. STEINTHAL: 20 Q. Is your intent to respond to any opinions 21 offered by anyone other than Professor Milgrom? 22 MR. HILLEGAS: Objection; form. 23 THE WITNESS: It is not my intent. 24 BY MR. STEINTHAL: 25 Q. And you understand that Professor</p>	<p style="text-align: right;">Page 97</p> <p>1 not to answer to the extent that any of those 2 communications may have been with counsel, but 3 to the extent that you had communications 4 outside of counsel and you know the answer to 5 question, you may answer yes or no. 6 THE WITNESS: To my knowledge, no. 7 BY MR. STEINTHAL: 8 Q. And again without revealing the substance 9 any of conversations you may have had, have you 10 discussed your response to Dr. Milgrom with 11 anyone other than counsel who is trained in 12 economics, auction theory, or market design? 13 MR. HILLEGAS: Same objections, 14 caution when speaking with the witness including 15 any of the staff that you may have had. 16 But you may answer yes or no outside 17 of that. 18 THE WITNESS: To the best of my 19 knowledge, no. 20 BY MR. STEINTHAL: 21 Q. Do you believe the insight or views of 22 someone trained in the same discipline as 23 Professor Milgrom would have aided you in 24 responding to his opinions? 25 MR. HILLEGAS: Objection; form.</p>

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<p style="text-align: right;">Page 98</p> <p>1 THE WITNESS: I do not believe that</p> <p>2 expertise in economics -- consulting with</p> <p>3 someone with expertise in economics would have</p> <p>4 directly assisted with the formation of my</p> <p>5 opinion.</p> <p>6 BY MR. STEINTHAL:</p> <p>7 Q. Okay. So, Professor, I'd like to get a</p> <p>8 list of the places in your report where you</p> <p>9 identify opinions that Professor Milgrom made,</p> <p>10 you are responding to. So I'm going to go the</p> <p>11 paragraph I have in my list one at a time that</p> <p>12 you listed in your report, and then I'll ask if</p> <p>13 I missed any.</p> <p>14 There are eight on my list, so as you</p> <p>15 flip through the report, if you notice any that</p> <p>16 I'm skipping, you can either tell me then or you</p> <p>17 can tell me at the end, but I'm going to go in</p> <p>18 order.</p> <p>19 So starting with paragraph two of your</p> <p>20 report, is this one of the opinions of Professor</p> <p>21 Milgrom's that you are responding to?</p> <p>22 A. This is a -- this is a summary of the</p> <p>23 opinion that I'm to respond to.</p> <p>24 Q. But the opinion that's summarized as that</p> <p>25 advertisers and publishers are able to optimize</p>	<p style="text-align: right;">Page 100</p> <p>1 that gives a summary as a -- as part of an</p> <p>2 outline of the rest of my report.</p> <p>3 Q. And the next paragraph I think we</p> <p>4 discussed earlier, paragraph 19, is a summary of</p> <p>5 Professor Milgrom's opinions, correct?</p> <p>6 MR. HILLEGAS: Objection; form.</p> <p>7 THE WITNESS: This paragraph,</p> <p>8 paragraph 19, is a summary of the portion of</p> <p>9 Dr. Milgrom's opinions that I'm responding to.</p> <p>10 BY MR. STEINTHAL:</p> <p>11 Q. And is paragraph 20 also a paragraph that</p> <p>12 describes or references opinions or assumptions</p> <p>13 of Professor Milgrom that you're responding to</p> <p>14 your report?</p> <p>15 A. Paragraph 20 does reference Dr. Milgrom's</p> <p>16 opinion.</p> <p>17 Q. Any particular opinions in paragraph 20</p> <p>18 are among the things you're responding to in</p> <p>19 your report?</p> <p>20 A. Paragraph 20 is where I start to explain</p> <p>21 my approach to responding to Dr. Milgrom's --</p> <p>22 selected Dr. Milgrom opinion.</p> <p>23 Q. And paragraph 21, is that also a section</p> <p>24 where you describe an opinion of Dr. Milgrom and</p> <p>25 begin to explore your response to it?</p>
<p style="text-align: right;">Page 99</p> <p>1 their behavior, et cetera, is a summary of</p> <p>2 Dr. Milgrom's opinion that you're responding to?</p> <p>3 A. The able part is, I think, an assumption</p> <p>4 in Dr. Milgrom's report. He says that they do</p> <p>5 and that they're successful which implies that</p> <p>6 they are able, but my critique goes to their</p> <p>7 ability to do this well.</p> <p>8 Q. Now turn to page -- to paragraph --</p> <p>9 sorry, not page -- paragraph 13 of your report.</p> <p>10 Is that also similarly a description or</p> <p>11 paraphrase of an opinion of Dr. Milgrom's that</p> <p>12 you're responding to in your report?</p> <p>13 A. Again this is -- this is extracting a bit</p> <p>14 of an assumption that's there in Dr. Milgrom's</p> <p>15 report that's necessary for the statements that</p> <p>16 are made as I explained further.</p> <p>17 Q. But that assumption is one of the things</p> <p>18 that you're responding to in your opinions?</p> <p>19 A. Exactly.</p> <p>20 Q. So the next one I have on my list is</p> <p>21 paragraph 18 of your report. Is that also a</p> <p>22 paragraph that describes opinions or assumptions</p> <p>23 of Professor Milgrom to which you're responding</p> <p>24 in your report?</p> <p>25 A. There's a sentence here early on that --</p>	<p style="text-align: right;">Page 101</p> <p>1 MR. HILLEGAS: Objection; form.</p> <p>2 THE WITNESS: In paragraph 21 I -- I</p> <p>3 give an interpretation of Dr. Milgrom's opinion</p> <p>4 and then respond to it.</p> <p>5 BY MR. STEINTHAL:</p> <p>6 Q. Moving ahead to paragraph 24, is that</p> <p>7 also a place where you describe some of</p> <p>8 Professor Milgrom's opinions or assumptions to</p> <p>9 which you are responsive in your report?</p> <p>10 MR. HILLEGAS: Objection; form.</p> <p>11 THE WITNESS: In paragraph 24 in the</p> <p>12 first sentence, I have a -- in the first</p> <p>13 sentence, I have an -- again a summary of</p> <p>14 portions of Dr. Milgrom's report that I am</p> <p>15 responding to.</p> <p>16 BY MR. STEINTHAL:</p> <p>17 Q. And the last one on my list is final</p> <p>18 paragraph of the report, paragraph 43. Is that</p> <p>19 also -- I'm sorry. That's not the last</p> <p>20 paragraph in your report.</p> <p>21 Paragraph 43 -- is that also a paragraph</p> <p>22 that describes opinions or assumptions of</p> <p>23 Dr. Milgrom's to which you are responding in</p> <p>24 your report?</p> <p>25 MR. HILLEGAS: Objection; form.</p>

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<p style="text-align: right;">Page 102</p> <p>1 THE WITNESS: 43 does reference and</p> <p>2 summarize portions of Dr. Milgrom's report.</p> <p>3 BY MR. STEINTHAL:</p> <p>4 Q. Are there any other portions of -- strike</p> <p>5 that.</p> <p>6 Are any places in your report where you</p> <p>7 identify additional opinions of Dr. Milgrom to</p> <p>8 which you respond that we have not yet</p> <p>9 discussed?</p> <p>10 MR. HILLEGAS: Objection; form.</p> <p>11 Caution the witness that you may</p> <p>12 take whatever time you need to review the report</p> <p>13 to form an answer.</p> <p>14 THE WITNESS: Is there a listing of</p> <p>15 the paragraphs that you have that you're</p> <p>16 referencing.</p> <p>17 BY MR. STEINTHAL:</p> <p>18 Q. I can read them to you again. I had</p> <p>19 referenced paragraphs 2, 13.</p> <p>20 A. Did you -- what about section titles?</p> <p>21 Q. You want to add it to the list. I can</p> <p>22 add it to the list.</p> <p>23 A. I was just saying title of section 3 is</p> <p>24 and, yeah, paragraph 18 with and 19, yeah, so --</p> <p>25 so there we have 20 and 21.</p>	<p style="text-align: right;">Page 104</p> <p>1 BY MR. STEINTHAL:</p> <p>2 Q. Okay. Do you recognize this report?</p> <p>3 A. I do.</p> <p>4 Q. And you relied on it in forming your own</p> <p>5 report?</p> <p>6 A. I relied on portions.</p> <p>7 Q. Portions of it. Okay.</p> <p>8 So now directing you to -- we're going to</p> <p>9 flip back and forth between the two, so you</p> <p>10 might want to keep them both handy.</p> <p>11 A. Yep.</p> <p>12 Q. Directing your opinion to paragraph two</p> <p>13 of your report, you see -- you say -- you see</p> <p>14 that it says that you were asked to, quote,</p> <p>15 "respond to the opinion of Professor Milgrom's</p> <p>16 expert report that advertisers and publishers</p> <p>17 are able to optimize their behavior in response</p> <p>18 to modifications that Google introduces to its</p> <p>19 auctions and programs"; is that correct?</p> <p>20 A. Yes.</p> <p>21 Q. And then flip ahead to paragraph 13 of</p> <p>22 your report, do you see substantially equivalent</p> <p>23 statement?</p> <p>24 MR. HILLEGAS: Objection; form.</p> <p>25 THE WITNESS: Yes.</p>
<p style="text-align: right;">Page 103</p> <p>1 So the previously mentioned paragraphs</p> <p>2 are the ones where I explicitly refer to</p> <p>3 Dr. Milgrom, but implicitly, my entire report is</p> <p>4 referencing what Dr. Milgrom says.</p> <p>5 (Exhibit Number 2 was marked.)</p> <p>6 BY MR. STEINTHAL:</p> <p>7 Q. Okay. So let's look at those paragraphs</p> <p>8 in -- in more detail. To look at that I'm going</p> <p>9 to hand you a document that's been marked</p> <p>10 Somayaji Exhibit 2, which is the expert report</p> <p>11 of Professor Milgrom dated July 30th, 2024.</p> <p>12 A. Okay.</p> <p>13 MR. STEINTHAL: I probably have more</p> <p>14 copies. You may have your own copy. It's not a</p> <p>15 surprising exhibit.</p> <p>16 THE WITNESS: Thank you.</p> <p>17 MR. HILLEGAS: This is a big</p> <p>18 exhibit.</p> <p>19 THE WITNESS: Yeah.</p> <p>20 MR. HILLEGAS: And while you're</p> <p>21 taking a moment, I saw the food. We've been</p> <p>22 about an hour. I don't know how big your next</p> <p>23 module is.</p> <p>24 MR. STEINTHAL: Try to get through</p> <p>25 one more little section here if we can.</p>	<p style="text-align: right;">Page 105</p> <p>1 BY MR. STEINTHAL:</p> <p>2 Q. And those are intended to respond to the</p> <p>3 same opinion of Professor Milgrom; is that</p> <p>4 correct?</p> <p>5 MR. HILLEGAS: Objection; form.</p> <p>6 THE WITNESS: They are both</p> <p>7 referencing the same opinion.</p> <p>8 BY MR. STEINTHAL:</p> <p>9 Q. In both of those sentences, you use the</p> <p>10 phrase, quote, "optimize their behavior."</p> <p>11 How do you understand that phrase?</p> <p>12 MR. HILLEGAS: Objection; form.</p> <p>13 Professor, if you need something to</p> <p>14 mark it.</p> <p>15 THE WITNESS: Thank you.</p> <p>16 So in both of those paragraphs when</p> <p>17 it talks about, you know, the claims that</p> <p>18 publishers and advertisers are able to optimize</p> <p>19 their behavior in response to the changes that</p> <p>20 Google introduces to its ad option programs</p> <p>21 really talking about, you know, on page 35, the</p> <p>22 heading just before paragraph 32, the section</p> <p>23 says: Plaintiff's experts analyze and</p> <p>24 underestimate the role of experimentation for</p> <p>25 optimizing returns.</p>

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<p style="text-align: right;">Page 106</p> <p>1 And from here Dr. Milgrom goes and 2 talks about the importance of experimentation, 3 and my response to this is really about 4 determining the ability of such experimentation 5 to provide accurate incites into the functioning 6 of Google. 7 BY MR. STEINTHAL: 8 Q. My question was: In your report, in 9 paragraphs 2 and 13, you use the three-word 10 phrase or four-word phrase "to optimize their 11 behavior." My question is: What was your 12 understanding of the phrase optimize their 13 behavior when you wrote those paragraphs? 14 MR. HILLEGAS: Objection; form. 15 THE WITNESS: When I say optimize 16 their behavior, I'm directly referring to how 17 Dr. Milgrom's discussion of -- you know, so in 18 the paragraph 32 talking about advertiser's 19 leverage key performance indicators or 20 advertiser optimization, using by-side tools, 21 using publishers, you know, talking about these 22 parties doing experiments to optimize and so 23 that's the "they," you know. 24 BY MR. STEINTHAL: 25 Q. But I'm asking more precisely for a</p>	<p style="text-align: right;">Page 108</p> <p>1 money, and some -- you know, which is controlled 2 by various parameters that they have. 3 And so how do they optimize that? 4 How do they get better based on their 5 understanding of where they are in the space? 6 BY MR. STEINTHAL: 7 Q. Okay. So it's fair to say that the 8 concept of optimization involves trying to get 9 to a better outcome of a higher ground or a 10 better -- better place? 11 MR. HILLEGAS: Objection; form. 12 THE WITNESS: Optimization is about 13 finding that higher ground, yes. 14 BY MR. STEINTHAL: 15 Q. Okay. So when we refer optimizing in 16 later questions, I'm going to use that 17 definition, if that -- if that works for you; is 18 that fair? 19 A. Yes. 20 Q. So it's fair to say when you say you're 21 responding to Professor Milgrom's claim that 22 publishers -- 23 (Reporter clarification.) 24 Q. Strike that question. I'll try again. 25 So if I were to substitute that</p>
<p style="text-align: right;">Page 107</p> <p>1 definition of the word optimize in that context. 2 What does it mean to optimize one's behavior? 3 MR. HILLEGAS: Objection; form. 4 THE WITNESS: When I think of 5 optimization, I -- I inevitably think about -- 6 goes back to my understanding of genetic 7 algorithms and fitness landscapes, and so the 8 idea is that you have a space of possibilities, 9 and entities will find themselves in a 10 particular part of the space, and they're going, 11 I would like -- you know, I want to move to 12 higher ground or lower ground. 13 Optimization is typically I want to 14 get to that higher point. How do I get to that 15 higher point? And so the optimization is the 16 process of searching the space of possibilities 17 to find ones that have that better value. And 18 there's all kinds of strategies for searching a 19 space to under -- to gain that understanding. 20 So that's how I think of 21 optimization in general, and when I look at what 22 these various parties are doing, what -- you 23 know, what these tools the advertisers, what 24 publishing are trying to do, they're trying to 25 get that higher point in the space of making</p>	<p style="text-align: right;">Page 109</p> <p>1 definition that we just gave for optimize into 2 paragraph 13 of your report, let's say, is it 3 fair to say that you're trying to respond to 4 Dr. Milgrom's claim that publishers and 5 advertisers are able to seek better outcomes or 6 higher -- or better value in response to their 7 changes -- their changes that Google -- in 8 response to the changes that Google introduces 9 to its ad auction programs; is that a fair 10 paraphrase? 11 MR. HILLEGAS: Objection; form. 12 MR. STEINTHAL: I'll try to rephrase 13 the question in response to the objection. 14 BY MR. STEINTHAL: 15 Q. In paragraph 13 you were identifying an 16 opinion of Dr. Milgrom's to which your 17 response -- your report is responsive; is that 18 correct? 19 A. Yes. 20 Q. Is it fair to say that the substance of 21 that opinion to which you're responding is that 22 publishers and advertisers are able to change 23 their behavior in response to changes that 24 Google introduces to its ad auction programs so 25 as to obtain better value for themselves?</p>

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<p style="text-align: right;">Page 110</p> <p>1 MR. HILLEGAS: Objection; form.</p> <p>2 THE WITNESS: This gets to heart</p> <p>3 what optimization means. So it's always</p> <p>4 possible to optimize a system simply through</p> <p>5 trial and error. You try different things and</p> <p>6 you see what happens. And some of them will be</p> <p>7 better, and some are worse. If you just keep</p> <p>8 trying enough random things, eventually you</p> <p>9 might get to a better -- you know, better part</p> <p>10 of the space.</p> <p>11 When -- when I understand what</p> <p>12 Dr. Milgrom is referring to when he talks about</p> <p>13 optimize, I do not understand that he's talking</p> <p>14 about a random search where they're just doing</p> <p>15 trial and error because trial and error is</p> <p>16 always possible.</p> <p>17 What my understanding is that they</p> <p>18 can do, what I would say, effective</p> <p>19 optimization. They can do experiments which</p> <p>20 give them insight, and that insight can be built</p> <p>21 upon to improve performance. And that is</p> <p>22 specifically not trial and error; it's guided by</p> <p>23 their understanding of the system.</p> <p>24 So -- so if we're talking about</p> <p>25 optimize -- if we're talking optimize in the</p>	<p style="text-align: right;">Page 112</p> <p>1 statement of what Dr. Milgrom was saying that</p> <p>2 publishers and advertisers can change their</p> <p>3 behavior in response to Google's auction changes</p> <p>4 so as to obtain better value or otherwise better</p> <p>5 performance for their goals?</p> <p>6 MR. HILLEGAS: Objection; form.</p> <p>7 THE WITNESS: My understanding of</p> <p>8 Dr. Milgrom's opinion is that it's not just</p> <p>9 that, you know, participants in the ecosystem</p> <p>10 that can make changes that improve performance.</p> <p>11 It's that they can make changes in response to</p> <p>12 the results from specific experiments, and that</p> <p>13 is what -- you know, that's the opinion I'm</p> <p>14 responding to, because again, if you look at</p> <p>15 Dr. Milgrom's report, he's saying -- you know,</p> <p>16 specifically the title of the section is, you</p> <p>17 know, underestimate the role of experimentation</p> <p>18 for optimizing returns. If it's a random space,</p> <p>19 you know, experiments don't buy you anything.</p> <p>20 You have to be able to understand the structure.</p> <p>21 BY MR. STEINTHAL:</p> <p>22 Q. But you're responding to Professor</p> <p>23 Milgrom's claim that experimentation is a useful</p> <p>24 means by which advertisers and publishers can</p> <p>25 seek to improve their outcomes?</p>
<p style="text-align: right;">Page 111</p> <p>1 sense of can I just try things and see if it</p> <p>2 gets better, you know -- you know, then I would</p> <p>3 say, you know, then tech -- you know, I would</p> <p>4 say this is -- this is not correct.</p> <p>5 But my understanding of optimize in</p> <p>6 the context of Dr. Milgrom is that they'll do</p> <p>7 experiments to get insight and that would direct</p> <p>8 it, and in that sense of the word optimize, that</p> <p>9 is -- that is what, you know, what I'm saying</p> <p>10 is, what I'm saying is -- I'm saying I don't</p> <p>11 think they can do that so effectively.</p> <p>12 MR. HILLEGAS: We've been on the</p> <p>13 hour for about an hour now.</p> <p>14 MR. STEINTHAL: Yeah. I have a few</p> <p>15 more questions, then we can wrap it up.</p> <p>16 BY MR. STEINTHAL:</p> <p>17 Q. I just want to stay on this response for</p> <p>18 a moment.</p> <p>19 My question right now is whether you</p> <p>20 agree with Dr. Milgrom whether this is possible</p> <p>21 or not possible. I'm trying to understand --</p> <p>22 get on the record your understanding of the</p> <p>23 opinion of Dr. Milgrom that you're responding</p> <p>24 to.</p> <p>25 So do you think that it is a fair</p>	<p style="text-align: right;">Page 113</p> <p>1 MR. HILLEGAS: Objection; form.</p> <p>2 THE WITNESS: I'm not offering an</p> <p>3 opinion on whether the real world tools that are</p> <p>4 used by these parties provide any value or not,</p> <p>5 you know, in terms of experimentation. I am</p> <p>6 talking about the information balance, and the</p> <p>7 information balance is really saying how hard is</p> <p>8 this problem to do and -- and bounds how well it</p> <p>9 can be done.</p> <p>10 BY MR. STEINTHAL:</p> <p>11 Q. But you are responding to a claim of</p> <p>12 Dr. Milgrom that what you contend that</p> <p>13 Dr. Milgrom that experimentation is a way by</p> <p>14 which publishers and advertisers can seek to</p> <p>15 obtain better outcomes for their goals?</p> <p>16 MR. HILLEGAS: Objection; form.</p> <p>17 THE WITNESS: So Dr. Milgrom is in</p> <p>18 turn responding to other experts. And in</p> <p>19 paragraph 32 Dr. Milgrom is saying, you know --</p> <p>20 you know, plaintiff and their experts claim that</p> <p>21 optimization process for publishers and</p> <p>22 advertisers was compromised because Google did</p> <p>23 not disclose their secret programs. And</p> <p>24 plaintiff's expert suggests that this alleged</p> <p>25 failure to disclose would mislead a typical</p>

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<p style="text-align: right;">Page 114</p> <p>1 advertiser or publisher, keeping it from 2 optimizing its choices effectively. 3 And the rest of Dr. Milgrom's, you 4 know, section is essentially saying that isn't 5 true, and -- and then goes to say what 6 advertisers do in practice. 7 I'm responding to basically saying 8 that they can't be done effectively. I'm saying 9 there are limits on the effectiveness because of 10 the complexity of the system and the lack of 11 transparency about that system. 12 BY MR. STEINTHAL: 13 Q. But what it means to be effective, the 14 goal they're trying to accomplish through the 15 optimization or what it means is to -- to get to 16 a better outcome for their goals, correct? 17 MR. HILLEGAS: Objection; form. 18 THE WITNESS: I can't speak to the 19 economics motivation of the participants in this 20 environment. You know, what I can speak about 21 is the technical utility of certain options, and 22 so they are -- you know, so this is a discussion 23 about, you know -- you know, previously saying 24 that participants being misled because of lack 25 of transparency.</p>	<p style="text-align: right;">Page 116</p> <p>1 MR. HILLEGAS: Objection; form. 2 THE WITNESS: At the heart of what 3 I'm talking about here when we're talking about 4 optimization is we're talking about the 5 structure of the landscape and the ability of 6 participants to see the landscape under which 7 they are searching. 8 There's a concept from genetic 9 algorithms that landscapes can be deceptive, 10 that they hide information so that when you're 11 searching on the space, you don't know where you 12 are. You think that, oh, look. It's all going 13 up. It's going up. Well, actually I'm going to 14 cliff, and actually everything is going horrible 15 after this. So you don't know the structure. 16 If I translate Dr. Milgrom's 17 language really into that context, Dr. -- you 18 know, Dr. Milgrom's responding to saying you 19 can't optimize -- you know, it's like saying, 20 you know, the search for better outcomes is 21 compromised because of the lack of information. 22 Milgrom's saying, there's enough 23 information because they can do experiments. 24 And I'm saying look at structure of the 25 landscape, because the landscape is determined</p>
<p style="text-align: right;">Page 115</p> <p>1 Milgrom is saying that lack of 2 transparency is normal, and so -- and -- and 3 there's all these methods to optimize, you know, 4 things, and my report's going, they can try to 5 optimize, but there's an information imbalance 6 in the system which limits their ability to 7 effectively optimize. 8 BY MR. STEINTHAL: 9 Q. Let me try a concrete example. Hopefully 10 we can wrap this up for lunch. 11 A. Sure. 12 Q. Let's assume a publisher is making \$100 13 from selling ad space on their website, and they 14 run some experiments with change in their floor 15 prices or other change in parameters system to 16 try to see if they can get to \$110. Is that an 17 example of optimizing or trying to optimize? 18 MR. HILLEGAS: Objection; form. 19 THE WITNESS: That is an example. 20 BY MR. STEINTHAL: 21 Q. And if they could get successfully get to 22 \$110, it wouldn't be any less an optimization 23 mechanism if it was also possible that if they 24 had done something else, they might have gone to 25 \$120, correct?</p>	<p style="text-align: right;">Page 117</p> <p>1 by the code. And I'm saying that landscape is 2 really hard to understand and search because 3 look at how complicated it is. 4 BY MR. STEINTHAL: 5 Q. Do you think that Professor Milgrom 6 shares that understanding of the word optimize? 7 MR. HILLEGAS: Objection; form. 8 THE WITNESS: I cannot speak to what 9 Dr. Milgrom does or does not understand about 10 optimization. What I can say is that in this 11 argument is an attempt to say that information 12 that's being hidden from participants is not -- 13 you know, it does not effect their behavior 14 because they can do -- I mean, implicitly I read 15 this as implicitly do experiments to understand 16 what's going on. And if you do those 17 experiments and are really good at doing those 18 experiments, they'll understand what's going on. 19 And I'm going, can they understand it? Let's 20 look at the system. How hard would it be to 21 understand those experiments, and that's what my 22 report is talking about. 23 MR. STEINTHAL: This is a good 24 stopping point. Off the record. 25 THE VIDEOGRAPHER: We're going off</p>

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<p style="text-align: right;">Page 118</p> <p>1 the record at 12:07 p.m. 2 (Off the record.) 3 THE VIDEOGRAPHER: We're going back 4 on the record at 1:00 p.m. 5 BY MR. STEINTHAL: 6 Q. Good afternoon. Welcome back. Just to 7 put a couple things on the record as we go back 8 into the testimony, did you discuss the 9 substance of your testimony with Counsel during 10 the break? 11 MR. HILLEGAS: Objection to the 12 form. I'll instruct the witness not to answer 13 that question under the expert witness 14 stipulation. 15 MR. STEINTHAL: So just to be clear, 16 Counsel, you're instructing him not to answer 17 the question on whether or not you discussed the 18 substance of his testimony during the break; is 19 that correct? 20 MR. HILLEGAS: I think that 5.5 21 (inaudible) covers any communications between 22 the witness and Counsel. 23 BY MR. STEINTHAL: 24 Q. And I asked you before, and I'll ask you 25 again: Is there anything that from your</p>	<p style="text-align: right;">Page 120</p> <p>1 claim that the optimization process for 2 publisher and advertiser was compromised because 3 Google did not disclose the secret programs. 4 And then, I think the paragraph goes on to say, 5 "Things are kept secret." And then it goes on 6 to say, "In practice, evidence suggests that 7 tech intermediaries, in-house marketing tools, 8 ad agencies, and publishers who rely heavily 9 feedback and experimentation to optimize their 10 performance" and then describes to which they 11 optimize their performance. And further in 33, 12 saying, Google's tools make such experiments 13 easier for its customers. 14 So this discussion is saying that 15 Dr. Milgrom's offering the evidence of 16 experiments and Google facilitating those 17 experiments to counter, you know, the point, you 18 know, from the plaintiffs that failures to 19 disclose would mislead typical advertiser or 20 publisher, keeping it from optimizing its 21 choices effectively. And here I'm saying, 22 you -- that I'm discussing that the information 23 talking about paragraph -- how some of its 24 arguments implies that Google does not have a 25 significant information advantage over other</p>
<p style="text-align: right;">Page 119</p> <p>1 testimony before that you need to correct or 2 amend? 3 A. Not at this time. 4 Q. Okay. Thank you. Okay. Great. 5 So back to the Exhibit 1 of your report. 6 I'm directing your attention to paragraph 18 of 7 your report. 8 A. Okay. Give me a second. 9 Q. The second sentence reads, "First, in 10 Section 3, I discussed -- discussed 11 Dr. Milgrom's expert report explaining how some 12 of his arguments implied that Google does not 13 have a significant information advantage over 14 other participants." Do you see that? 15 A. Yes. 16 Q. Where in Dr. Milgrom's report does he say 17 that anything to the effect of Google does not 18 have a significant information advantage over 19 other participants? 20 A. So what I say is that it's not that he 21 states that but that he implies it. So the 22 implication is in -- if you go back to 23 Dr. Milgrom's report. 24 So starting in paragraph 32 of 25 Dr. Milgrom's report, Plaintiff and the experts</p>	<p style="text-align: right;">Page 121</p> <p>1 participants. In order for the experimentation 2 that Dr. Milgrom describes to respond 3 effectively to the -- to the statements by the, 4 you know, plaintiff's experts, that would mean 5 that those experiments can overcome the 6 information difference. And I'm going -- that's 7 the impli- -- that's the implied part. 8 Q. That seems to be very similar to the 9 answer you gave me before the break with respect 10 to Dr. Milgrom's -- what you said was 11 Dr. Milgrom's opinion as to whether they could 12 optimize their behavior. 13 My question was about -- what you state 14 here is that some arguments imply that Google, 15 quote, does not have significant information 16 advantage over other participants. I didn't 17 hear anything -- was something in your response 18 that you just gave me in paragraph 32 that 19 discusses information advantage? 20 MR. HILLEGAS: Objection to form. 21 THE WITNESS: Dr. Milgrom does not 22 directly talk about the information advantage 23 but is responding to a point about information 24 advantage. So Dr. Milgrom is saying that, you 25 know, the plaintiffs are saying that there's</p>

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<p style="text-align: right;">Page 122</p> <p>1 this information difference and then saying 2 that -- well, first, says that that information 3 difference is normal, there's things that are 4 kept secret. And then goes on to say, there -- 5 you know, but -- and these parties all do 6 experiments. And those experiments only make 7 sense as a counter -- as a counter to what's 8 being said, those experiments negate the 9 information advantage. 10 So -- and thus, what my paragraph's 11 saying is that that's a summary of what implied 12 that Google does not have a significant 13 information advantage, because if you don't take 14 that interpretation, the evidence that 15 Dr. Milgrom offered doesn't counter what the 16 plaintiff's expert say. 17 BY MR. STEINTHAL: 18 Q. So looking at paragraph 32 of 19 Dr. Milgrom's report again, as you point out, 20 he's responding to a quote that he gives -- 21 that -- a paraphrase that he gives for 22 plaintiff's statement. Quote, Google did not 23 disclose their secret program. 24 Is that the information advantage that 25 you believe he is denying?</p>	<p style="text-align: right;">Page 124</p> <p>1 have been denying? 2 MR. HILLEGAS: Objection; form. 3 THE WITNESS: I understand that to 4 be part of the information advantage but not in 5 whole. 6 BY MR. STEINTHAL: 7 Q. And what is the additional portion of the 8 information advantage that is not listed in the 9 second line in paragraph 32 that you think 10 Dr. Milgrom was responding to? 11 A. So the statement that Dr. Milgrom's 12 responding to is not just that these things are 13 secrets -- that are secrets that are being kept 14 but that they make -- they would mislead. And 15 so -- so it's both of those together. 16 Q. So if I understand your last response 17 correctly, you're saying there is an information 18 advantage, the secrets that are being kept. And 19 then there's an implication that he draws from 20 that -- well, that the plaintiff's expert draws 21 from that that would also keep from optimizing 22 effectively, and you think Dr. Milgrom is 23 responsible for both of those things? 24 MR. HILLEGAS: Objection to form. 25 THE WITNESS: Yes.</p>
<p style="text-align: right;">Page 123</p> <p>1 MR. HILLEGAS: Objection; form. 2 THE WITNESS: Dr. Milgrom further 3 discusses the work in following sentence. 4 Plaintiff's expert suggest that this alleged 5 failure to disclose would mislead a typical 6 advertiser or publisher, keeping it from 7 optimizing its choices effectively. 8 BY MR. STEINTHAL: 9 Q. But I'm trying to understand the nature 10 of the information advantage that you think that 11 Dr. Milgrom is denying. Is it -- strike that. 12 I'll try again. 13 If I understood your response, you're 14 saying, plaintiffs and their experts assert 15 there was an information advantage? 16 A. Yes. 17 Q. And then Dr. Milgrom denied that and you 18 are responding to Dr. Milgrom's denial of the 19 that initial statement; is that correct? 20 A. Correct. 21 Q. So I'm focusing on that initial statement 22 to which Dr. Milgrom was responding. The quote 23 here is that Google did not disclose their 24 secret programs. Is that the information 25 advantage that you understood Dr. Milgrom to</p>	<p style="text-align: right;">Page 125</p> <p>1 BY MR. STEINTHAL: 2 Q. And so if I, for the moment, put to the 3 side the implication and I just focus on what is 4 the nature of the information advantage at issue 5 here in this sentence, it's the not disclosing 6 their secret programs is what the plaintiff's 7 expert is saying, correct? 8 A. Dr. Milgrom isn't responding -- 9 (indiscernible) his response. He's not 10 responding to any specific thing except to just 11 say those secrets are normal. The counting of 12 the information advantage is through citing 13 experiments that are done by various parties and 14 the fact that they're facilitated by Google, and 15 that is the counter to the information 16 advantage. And so what I'm discussing is, well, 17 let's understand the information advantage by 18 looking at the code of the system to see that 19 difference and then in that light of that, to 20 see, could experiments negate this. 21 Q. But the secrecy that you're referring to 22 in paragraph 32 is about the nature of Google's 23 systems themselves, correct? 24 MR. HILLEGAS: Objection; form. 25 THE WITNESS: The citation here in</p>

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<p style="text-align: right;">Page 126</p> <p>1 Dr. Milgrom's report is really about -- he's</p> <p>2 referring to the very specific secret programs</p> <p>3 that are disclosed in the other reports and</p> <p>4 discussing what -- what would mislead. The</p> <p>5 reply in which I'm responding to isn't really</p> <p>6 responding to that. It's really making a more</p> <p>7 general statement by implication which is</p> <p>8 experiments in the Google Ads ecosystem are</p> <p>9 sufficient to understand what's going on to</p> <p>10 allow for effective optimization. That's my</p> <p>11 interpretation and that's the -- that's the</p> <p>12 implication. And so that is what -- that is the</p> <p>13 opinion I am responding to, but I'm not</p> <p>14 responding to the particular secret programs.</p> <p>15 BY MR. STEINTHAL:</p> <p>16 Q. Where in paragraph 21 -- sorry. Strike</p> <p>17 that.</p> <p>18 Where in paragraph 32?</p> <p>19 MR. HILLEGAS: Objection; form.</p> <p>20 BY MR. STEINTHAL:</p> <p>21 Q. I'll try again. We've been talking about</p> <p>22 paragraph 32 of Professor Milgrom's report,</p> <p>23 correct?</p> <p>24 A. Yes.</p> <p>25 Q. Where in this paragraph do you see an</p>	<p style="text-align: right;">Page 128</p> <p>1 from these, I interpret this as saying that</p> <p>2 through experimentation, other parties can do</p> <p>3 sufficient experiments to understand what's</p> <p>4 happening in order to optimize their bids, in</p> <p>5 order to optimize their economic performance.</p> <p>6 And -- so Dr. Milgrom didn't</p> <p>7 directly address information advantage.</p> <p>8 Dr. Milgrom instead says, these experiments --</p> <p>9 these experimentations that happens, you know,</p> <p>10 the disadvantage there is normal and there's</p> <p>11 experiments. And it just sort of says there's</p> <p>12 experiments and implies that those experiments</p> <p>13 are sufficient to negate any advantage there is.</p> <p>14 So I am responding to an argument</p> <p>15 that Dr. Milgrom is making but is making by</p> <p>16 citing points without actually responding to</p> <p>17 what was previously said but is clearly in</p> <p>18 response to that.</p> <p>19 Q. But is there any place where, to your</p> <p>20 knowledge, Dr. Milgrom explicitly says that</p> <p>21 publishers and the advertisers need to know how</p> <p>22 Google systems operate internally in order to</p> <p>23 run experiments?</p> <p>24 MR. HILLEGAS: Objection; form.</p> <p>25 THE WITNESS: Dr. Milgrom does not</p>
<p style="text-align: right;">Page 127</p> <p>1 indication or implication by Dr. Milgrom that</p> <p>2 publishers or advertisers can understand the</p> <p>3 internal operations of Google systems?</p> <p>4 MR. HILLEGAS: Objection; form.</p> <p>5 THE WITNESS: That's an implication</p> <p>6 I interpret, and it involves connecting pieces</p> <p>7 of this paragraph. So first there is citing of</p> <p>8 the specific work from the plaintiffs. There's</p> <p>9 the saying, okay, secrecies are normal and then</p> <p>10 saying, in practice, evidence suggests that</p> <p>11 Adtech intermediaries, in-house marketing tools,</p> <p>12 ad agencies, and publishers rely heavily on</p> <p>13 feedback and experimentation to optimize their</p> <p>14 performance.</p> <p>15 So -- and then -- and then</p> <p>16 Dr. Milgrom concludes in paragraph 34, after</p> <p>17 describing all this, says, "By ignoring the</p> <p>18 evidence that publishers and advertisers</p> <p>19 experiment and optimize their returns from</p> <p>20 display advertising and the plaintiffs and their</p> <p>21 experts underestimate the amounts that Google</p> <p>22 customers can earn from these programs." So --</p> <p>23 so this is an economic take on this,</p> <p>24 (indiscernible) of earnings. But my inter- --</p> <p>25 to be able to earn -- you know, earn properly</p>	<p style="text-align: right;">Page 129</p> <p>1 talk about the internal structure of Google</p> <p>2 systems and how they would be able to relate to</p> <p>3 the ability of market participants to make</p> <p>4 decisions. That's not -- that's not something</p> <p>5 he's analyzing. But in the structure of the</p> <p>6 argument that he has in paragraphs 32 through</p> <p>7 34, there is this implication about the</p> <p>8 information balance, which is what I'm</p> <p>9 responding to.</p> <p>10 BY MR. STEINTHAL:</p> <p>11 Q. If I refer you to the third sentence of</p> <p>12 paragraph 32, beginning in reality, do you see</p> <p>13 that?</p> <p>14 A. Yes.</p> <p>15 Q. Okay. So isn't the implication of that</p> <p>16 sentence -- strike that.</p> <p>17 Isn't Dr. Milgrom's point in paragraph 32</p> <p>18 that even assuming that Google did not disclose</p> <p>19 the internals of its operation, that that is</p> <p>20 normal and it does not compromise the publishers</p> <p>21 ability or the advertiser's ability to</p> <p>22 experiment. Is that Dr. Milgrom's claim?</p> <p>23 MR. HILLEGAS: Objection to form.</p> <p>24 THE WITNESS: What Dr. Milgrom says</p> <p>25 here, you know, is, quote, that in reality,</p>

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<p style="text-align: right;">Page 130</p> <p>1 processes for setting reserved prices and 2 determining bids and auctions are a truly kept 3 secret to prevent other auction participants 4 from gaining these strategies. So this is a 5 general statement about auctions, and there is 6 the assumption here that this generalization 7 applies to what is happening inside Google, that 8 this is a conventional auction, where there's 9 individual participants who, you know, have 10 their sources of information, have their bidding 11 strategies, but they're not, you know -- you 12 know, they're sort of a participant in on even 13 playing field. 14 When you look at the code and look 15 to see what's actually happening inside of this, 16 it's something much more complex than any 17 conventional auction. I mean -- and, you know, 18 this -- yeah. There's just a lot of 19 information, a lot of complexity, and a lot of 20 those are purely inside Google and are not 21 available to outside participants, and those 22 influence the functioning of the system. My 23 report is talking about that complexity. 24 BY MR. STEINTHAL: 25 Q. And that information that is only</p>	<p style="text-align: right;">Page 132</p> <p>1 [REDACTED] 2 [REDACTED] 3 [REDACTED] 4 [REDACTED] 5 [REDACTED] That's 6 7 what I'm talking about information balance, and 8 that's a lot. 9 BY MR. STEINTHAL: 10 Q. And I think that gets to my question, 11 which is paragraph 32 is talking about an 12 information advantage that Google allegedly has 13 because it knows more about its own, quote, 14 secret programs and doesn't disclose that to 15 third parties. And you just seem to have moved 16 to a different question which is whether or not 17 Google has more information about ad 18 impressions, about users, about publishers, et 19 cetera, to allow the better-set prices. 20 Are those the same thing? 21 MR. HILLEGAS: Objection to form. 22 THE WITNESS: The experts that 23 Dr. Milgrom is referring to -- or talking about 24 is a particular secret programs, you know, in 25 terms of how the auctions are performed. The</p>
<p style="text-align: right;">Page 131</p> <p>1 available inside of Google and not outside is 2 about the nature of Google systems, correct? 3 MR. HILLEGAS: Objection; form. 4 BY MR. STEINTHAL: 5 Q. I'll rephrase. That information that you 6 suggest is available only inside of Google and 7 not outside is about how Google's auction 8 mechanisms and algorithms function, correct? 9 MR. HILLEGAS: Objection; form. 10 THE WITNESS: Google's systems make 11 bidding choices and operate the auction using 12 vast amounts of data, which is coming from -- 13 just to point out part of my report, you know, 14 what's the key thing that's happening in these 15 auctions? A price has to be set for the 16 individual bids -- first of all, bidders have to 17 be selected and the prices have to be selected. 18 Those aren't just by default; those are chosen 19 and set inside Google. 20 Those prices -- there's this -- so 21 we go to page 21 of my report, which is talking 22 about [REDACTED] 23 [REDACTED] 24 [REDACTED] 25 [REDACTED]</p>	<p style="text-align: right;">Page 133</p> <p>1 response is about, you know -- you know, the 2 participants in the market can conduct 3 experiments to overcome these -- you know, to 4 overcome this information advantage. 5 What I'm doing in my report is 6 stepping back and going, if participants can do 7 experiments, that implies those experiments will 8 tell them enough to understand what's happening 9 about it in order for them to participate 10 effectively and optimize a performance. What is 11 the nature of the system in which they are 12 trying to -- they're trying to understand -- 13 what they're trying to understand to the degree 14 through experiments that they can place more 15 optimized bids. 16 And so my report is not about the 17 secret programs that are originally being 18 discussed. It's about this larger -- saying, 19 you can do experiments; what are those 20 experiments trying to uncover? And that 21 requires understanding the totality of the 22 internal advertising systems at Google, which is 23 what I tried to describe and the particular 24 parts that are relevant to this question of 25 information advantage.</p>

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<p style="text-align: right;">Page 134</p> <p>1 BY MR. STEINTHAL:</p> <p>2 Q. And one reason you don't respond to the</p> <p>3 reports of the particular secret programs</p> <p>4 discussed in paragraph 32 is that Dr. Milgrom</p> <p>5 agrees with you that the information is not</p> <p>6 available outside Google, right?</p> <p>7 MR. HILLEGAS: Objection to form.</p> <p>8 THE WITNESS: Dr. Milgrom mentions</p> <p>9 that it's normal for auction mechanisms to not</p> <p>10 be disclosed and that, you know, this is -- you</p> <p>11 know, this is -- sorry. It's saying that in</p> <p>12 reality, [REDACTED]</p> <p>[REDACTED] and auctions are routinely kept</p> <p>14 secret, preventing other auctions from gaining</p> <p>15 those strategic choices. He does say that. By</p> <p>16 saying that, he's implying that such secrets do</p> <p>17 not represent a significant information</p> <p>18 advantage. Similarly, citing all these</p> <p>19 experiments that any information advantage that</p> <p>20 might remain can be overcome through</p> <p>21 experiments, which are done routinely.</p> <p>22 I'm going -- and my response is</p> <p>23 saying, well, let's look at the system and to</p> <p>24 see if it's plausible for experiments to give</p> <p>25 sufficient information about the operation</p>	<p style="text-align: right;">Page 136</p> <p>1 plaintiff's experts were saying, there's stuff</p> <p>2 there that outsiders don't know about. I'm just</p> <p>3 saying -- I'm just expanding an effect on that</p> <p>4 saying, there's stuff they don't know about by a</p> <p>5 lot.</p> <p>6 BY MR. STEINTHAL:</p> <p>7 Q. So you allude to whether the playing</p> <p>8 field was balanced or not? It's your view that</p> <p>9 it's imbalanced, correct?</p> <p>10 A. My view is an information imbalance.</p> <p>11 Q. And information imbalance as you explain</p> <p>12 in your report, there's some who have</p> <p>13 information advantage and there's some who have</p> <p>14 information disadvantage, correct?</p> <p>15 A. Yes.</p> <p>16 Q. Who has the information advantage in this</p> <p>17 context -- in this example you're discussing</p> <p>18 here? When you say there's significant</p> <p>19 imbalance, who is the advantage party?</p> <p>20 A. The party with the greater advantage is</p> <p>21 Google over all other parties participating in</p> <p>22 the system.</p> <p>23 Q. So Google has the advantage and everyone</p> <p>24 else has the disadvantage?</p> <p>25 MR. HILLEGAS: Object to form.</p>
<p style="text-align: right;">Page 135</p> <p>1 system to allow external parties to predict how</p> <p>2 things are going to work inside.</p> <p>3 BY MR. STEINTHAL:</p> <p>4 Q. Do you think the objective that</p> <p>5 advertisers and publishers are trying to achieve</p> <p>6 is understanding how Google systems work?</p> <p>7 MR. HILLEGAS: Objection to form.</p> <p>8 THE WITNESS: Advertisers and</p> <p>9 publishers are trying to -- I'd say win the game</p> <p>10 they're trying to play in. You know, whether,</p> <p>11 you know, advertisers are trying to get the most</p> <p>12 advertising benefit, you help further the</p> <p>13 product for a buck, publishers are trying to,</p> <p>14 you know, get as much money as they can. These</p> <p>15 are economic issues. These are outside the</p> <p>16 scope of my report. I'm not talking about</p> <p>17 economic incentives or what they want to do.</p> <p>18 What I am talking about is not the game that</p> <p>19 they're playing but the playing field on which</p> <p>20 they're playing it and the degree to which it's</p> <p>21 level or not. And that -- in which they can</p> <p>22 even see what the playing field look likes.</p> <p>23 That's what information balance is really</p> <p>24 saying. It's not like saying how they play the</p> <p>25 game; it's on what basis do they play? And the</p>	<p style="text-align: right;">Page 137</p> <p>1 THE WITNESS: Google has an</p> <p>2 advantage over all their participants in the ad</p> <p>3 ecosystem because they have more information.</p> <p>4 BY MR. STEINTHAL:</p> <p>5 Q. And who are those other participants that</p> <p>6 you are alluding to?</p> <p>7 MR. HILLEGAS: Objection; form.</p> <p>8 THE WITNESS: The other participants</p> <p>9 are advertisers, publishers, and third-party</p> <p>10 exchanges and buy-side and sell-side tools</p> <p>11 aggregators.</p> <p>12 BY MR. STEINTHAL:</p> <p>13 Q. And the reason why Google has an</p> <p>14 advantage over all of those other parties that</p> <p>15 you just listed is because Google is aware of</p> <p>16 the details -- the internal details of how its</p> <p>17 algorithms operate; is that correct?</p> <p>18 MR. HILLEGAS: Objection; form.</p> <p>19 THE WITNESS: Google's aware of the</p> <p>20 internal algorithms. Google is also aware of</p> <p>21 the inputs to those algorithms which -- which is</p> <p>22 models of -- well, there's information about</p> <p>23 particular ad impressions -- ad requests and</p> <p>24 there's information about advertisers,</p> <p>25 publishers, and users. All of these are brought</p>

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<p style="text-align: right;">Page 138</p> <p>1 to bare in the process of these auctions. So</p> <p>2 it's more than just an algorithm thing. Like,</p> <p>3 even if you had complete disclosure of the</p> <p>4 algorithm, if you don't know what the inputs are</p> <p>5 of the algorithm, you don't know necessarily</p> <p>6 what it's going to do, but the algorithms are</p> <p>7 not known and the data is not known.</p> <p>8 BY MR. STEINTHAL:</p> <p>9 Q. I just want to make sure I understand</p> <p>10 your last response. I understood you to say</p> <p>11 that the complete disclosure of the algorithm</p> <p>12 because you don't know what the inputs are. To</p> <p>13 be clear, are you trying to say that you need to</p> <p>14 know the nature of the inputs or their values?</p> <p>15 So, for example, I'll give you an example of,</p> <p>16 like, my question -- [REDACTED]</p> <p>21 So which were you trying to answer?</p> <p>22 MR. HILLEGAS: Objection; form.</p> <p>23 THE WITNESS: So third parties are</p> <p>24 given -- get a request for supply and ad bid, so</p> <p>25 this is a BidRequest. That come in as, you</p>	<p style="text-align: right;">Page 140</p> <p>1 say, The Trade Desk -- do you believe they need</p> <p>2 to know how Google is calculating its bids into</p> <p>3 the auction to determine what they should bid?</p> <p>4 MR. HILLEGAS: Objection; form.</p> <p>5 THE WITNESS: In order to -- in</p> <p>6 order to -- over on average to succeed in</p> <p>7 auctions, you have to bid well. The exact</p> <p>8 nature of bidding effectively is a whole, you</p> <p>9 know, area of economics. Dr. Milgrom is an</p> <p>10 expert in this; that's not my concern. But</p> <p>11 certainly, in order to do that bidding well, you</p> <p>12 have to know the right things. This is where</p> <p>13 the complex system -- where if you're going to</p> <p>14 participate in this, there's things -- how are</p> <p>15 the other participants in this environment going</p> <p>16 to act, you know. If I compare this to an</p> <p>17 ecosystem -- if I go out there, is there someone</p> <p>18 who's going to try eating me? Economic systems</p> <p>19 are subject to similar kinds of things. Are</p> <p>20 they going to get eaten or they going to be able</p> <p>21 to walk out and walk freely? That's the game</p> <p>22 he's always trying to predict. You have to be</p> <p>23 able to predict your environment. I'm saying</p> <p>24 the environment in which these folks are</p> <p>25 operating is opaque in the extreme.</p>
<p style="text-align: right;">Page 139</p> <p>1 know, the data structure they have, what do I --</p> <p>2 you know, what price do I set? In order to set</p> <p>3 that price effectively, they have to decide, you</p> <p>4 know -- they may have some value of how much</p> <p>5 they're willing to pay. They have to decide how</p> <p>6 much are -- what are others going to do, right?</p> <p>7 That's the nature of the auctions; you have to</p> <p>8 figure out what others might do.</p> <p>9 What are those others doing? Most</p> <p>10 of the others are all the Google internal</p> <p>11 bidders. How are those Google internal bidders</p> <p>12 setting their prices? [REDACTED]</p> <p>13 [REDACTED]</p> <p>14 [REDACTED]</p> <p>15 [REDACTED]</p> <p>16 [REDACTED] if I don't have access to</p> <p>18 those models, that data, and other things, I</p> <p>19 don't know what those things are going to</p> <p>20 output. So how can I make a guess of what --</p> <p>21 you know, as an outsider, what I should bid</p> <p>22 relative to what this giant thing is going to</p> <p>23 bid.</p> <p>24 BY MR. STEINTHAL:</p> <p>25 Q. Do you believe that a non-Google bidder,</p>	<p style="text-align: right;">Page 141</p> <p>1 BY MR. STEINTHAL:</p> <p>2 Q. But to make reasonable predictions about</p> <p>3 how other bidders are going to act, you need to</p> <p>4 know their internal operations?</p> <p>5 MR. HILLEGAS: Objection to form.</p> <p>6 THE WITNESS: If I'm going to go</p> <p>7 outside and I'm worried about -- if I'm worried</p> <p>8 about something bad happening to me, you know</p> <p>9 whether a rock's going to fall on my head or a</p> <p>10 tiger's going to attack me, I have to be able to</p> <p>11 predict -- I have to be able to make some</p> <p>12 predictions about the environment. What is the</p> <p>13 likelihood of the tiger coming along and eating</p> <p>14 me and a brick falling on my head? So I have a</p> <p>15 model of the world to be able to participate in</p> <p>16 it. How good is my model? How effective is it</p> <p>17 in this problem? Depends on the nature of the</p> <p>18 world in which I'm doing. Do I have to</p> <p>19 understand everything about the world? No. But</p> <p>20 I have to be able to model it well enough to be</p> <p>21 able to understand it to be able to make these</p> <p>22 choices.</p> <p>23 And that implies, like, how</p> <p>24 unpredictable is the environment, how</p> <p>25 complicated is it. If I see a very simple</p>

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<p style="text-align: right;">Page 142</p> <p>1 environment -- oh, I can make -- I can make a 2 very simple model and I can predict what's going 3 to happen. It won't capture everything. I'll 4 capture enough of it so I can walk outside -- 5 well, when I can go outside and when I don't. 6 But these, you know -- but if it's complicated, 7 I can't. 8 BY MR. STEINTHAL: 9 Q. So I'm going to -- I'm attempting to ask 10 you a question about the tiger, but I'm going to 11 take something a little more concrete here in 12 Nashville. If I'm going to walk across a busy 13 street, I need to have -- in order to safely, I 14 need to have a model of whether or not I'm going 15 to get hit by a car, right? 16 A. Exactly. 17 MR. HILLEGAS: Objection to form. 18 BY MR. STEINTHAL: 19 Q. And that model might take into account, 20 is there a traffic light there? Is the traffic 21 light red? Do I have the walk signal, right? 22 A. Yes. 23 Q. It might also take into account, is this 24 a heavily traffic road? Are there a lot of 25 cars, right?</p>	<p style="text-align: right;">Page 144</p> <p>1 Q. So my question's a little different. 2 A. Okay. 3 Q. The world is a complicated place 4 (indiscernible) can be very hard and that's -- 5 because what I'm trying to do is model what the 6 car next to me is going to do, what the 7 ambulance coming down the street is going to do, 8 what the woman with a child in tow is going 9 to -- in hand is going to do near crosswalk. In 10 order to understand those things, do I have to 11 understand how the ambulance works? 12 MR. HILLEGAS: Objection; form. 13 THE WITNESS: You don't need to 14 understand how the ambulance works, but you 15 still need to be able to predict lots of 16 characteristics about the ambulance. 17 BY MR. STEINTHAL: 18 Q. I need to predict the likelihood if the 19 ambulance is going to cross my path while I'm 20 trying to cross the street, right? 21 A. Will the ambulance straight line or will 22 it swerve to try to hit me? 23 Q. I don't need to the know whether the 24 ambulance is responding to a cardiac arrest 25 or loss of consciousness, right?</p>
<p style="text-align: right;">Page 143</p> <p>1 MR. HILLEGAS: Objection; form. 2 THE WITNESS: So the problem you're 3 describing isn't effective autonomous driving 4 problem or the autonomous walking problem, like 5 how hard is it to model the world so that I can 6 just walk around in it and not be, you know -- 7 and be able to avoid obstacles and do things. 8 It seems like there's a lot of, you know, common 9 thing in that we're actually close to solving 10 that with computers, that we can model the world 11 that we can make self-driving cars and stuff. 12 But when you talk to the experts, they go, like, 13 we are very, very far away. And the reason 14 we're very, very far away is because the world 15 is so complex and weird things happen all the 16 time. I'm saying that Google's internal 17 environment is complicated, like, you know -- 18 not exactly in the real world -- but it's a 19 level of complexity. There's all this 20 user-publisher interaction that understanding 21 what's going on there is fundamentally hard and 22 because it's fundamentally hard, unless there is 23 complete transparency about it, others won't be 24 able to optimize their behavior inside of it. 25 BY MR. STEINTHAL:</p>	<p style="text-align: right;">Page 145</p> <p>1 MR. HILLEGAS: Objection; form. 2 THE WITNESS: I don't need to know 3 the precise business of the ambulance. 4 BY MR. STEINTHAL: 5 Q. And I don't know whether it's an internal 6 combustion engine or electric battery-powered 7 engine other than perhaps to change its 8 acceleration rate? 9 MR. HILLEGAS: Objection to form. 10 THE WITNESS: Yes. 11 BY MR. STEINTHAL: 12 Q. So it's possible to interact in this 13 world, even a complex world, with treating other 14 entities as largely black boxes, correct? 15 MR. HILLEGAS: Objection; form. 16 THE WITNESS: This is the -- this is 17 the big problem of our day, actually, with 18 autonomous systems. How much do you have to 19 understand the internal state of these entities 20 that you're interacting with? 21 I would actually argue it's a 22 research question. Exactly how much you need to 23 understand in order to operate in the world, 24 because we don't know how to build systems that 25 actually can interact in a real world --</p>

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<p style="text-align: right;">Page 146</p> <p>1 effective on the road. 2 What was your question again? 3 I'm -- 4 BY MR. STEINTHAL: 5 Q. Well, my question had been about whether 6 you need to understand the internal operations 7 of the black boxes, but I'll be more concrete 8 with you. Let's put it back to our ad auction 9 context that's in this case. 10 A. Yes. 11 Q. It is your opinion that to bid 12 effectively in the AdX auction, a company like 13 The Trade Desk needs to know how Google's 14 internal operations actually function? 15 MR. HILLEGAS: Objection to form. 16 THE WITNESS: So what do we mean by 17 effective? That's where it really comes down to 18 is, is it effective in that they can achieve 19 certain goals? I mean, clearly, companies are 20 successful in running ad campaigns. My reports 21 about the information advantage, do they -- when 22 they participate in this, are they participating 23 at a disadvantage relative to others on an 24 information basis that is -- that potentially 25 could effect how they operate.</p>	<p style="text-align: right;">Page 148</p> <p>1 before anyone else. So you can buy the stock 2 quickly and then sell it and basically make a 3 tiny fraction of a cent in profit on this. And 4 if you just keep doing this algorithm 5 high-frequency trading -- if you have a high 6 frequency-trading, you can use a small 7 information advantage to skim money and take 8 money from all the, you know -- all the actors 9 in this market. But they aren't predicting 10 everything, and it's not to say that others 11 can't successfully execute trades. It's that 12 because -- because there's some parties that 13 have information advantage, they can participate 14 in the market in a way that takes away value 15 from other participants. 16 BY MR. STEINTHAL: 17 Q. And that's because of the nature of how 18 stock exchanges work, where a particular share 19 of stock is -- or block of shares is offered for 20 sale for a certain price and the first person 21 who supplies that offer wins the stock, right? 22 MR. HILLEGAS: Objection to form. 23 THE WITNESS: With high-frequency 24 trading, the nature of the advantage is the time 25 differential. Information advantage, in</p>
<p style="text-align: right;">Page 147</p> <p>1 BY MR. STEINTHAL: 2 Q. If I'm designing an automated bidding 3 system to bid into the AdX auction, so I'm chief 4 engineer at The Trade Desk and I'm trying to 5 build an algorithm to find an effective bid for 6 my advertiser customer, do I need to know what 7 Google is likely to bid against me or how Google 8 calculated amount is likely to bid against me? 9 MR. HILLEGAS: Objection; form. 10 THE WITNESS: So there's -- it 11 doesn't really make sense in this context to 12 talk about the optimal strategy of a particular 13 participant is because there's always -- we 14 aren't talking about a system where no one can 15 ever make any money in Google's ecosystem that 16 everyone else always loses. That's not -- 17 that's not what we're talking about. We're 18 talking about a system and what the information 19 advantage is. 20 If we're talking about trading, for 21 example, like a stock market or something, the 22 advantage -- disadvantage is closer to things 23 like what algorithm traders have. You know, if 24 you have information advantage, it means that -- 25 say, you can know prices a fraction of a second</p>	<p style="text-align: right;">Page 149</p> <p>1 general, is, you know, a very general concept, 2 and if I know more than you, I can make 3 decisions where, over a time, I'm going to able 4 to do better economically than you. 5 And so information here -- I'm not 6 even talking about -- you know, it's not -- 7 that's just sort of a general idea, and we can 8 see it in the concrete manifestation of 9 high-frequency trading, kind of the level of the 10 engineer who looks at the speed of light and 11 looks at how the networking and what's the 12 latency between these systems. And I'm saying, 13 there's definitely a difference how that can be 14 leveraged in terms of -- change your economic 15 outcomes. That's also very confusing, but I can 16 tell about that. I'm saying, if you're talking 17 about the speed of light, it's like you have a 18 big advantage in terms of how long you know 19 about things versus others in this metaphor. 20 BY MR. STEINTHAL: 21 Q. And in that analogy, it matters because 22 there is a first-to-get aspect of stock exchange 23 trading, right? Speed is an advantage? 24 MR. HILLEGAS: Objection to form. 25 THE WITNESS: The speed is an</p>

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1 advantage because if I know the price earlier, I
2 can then make bids on it accordingly. But
3 similarly, in Google's system, it's not about
4 knowing it's faster, it's about -- it's about
5 knowing the price before others do and making
6 decisions based on Google knows the price
7 internally because they're being set by their
8 models.

9 BY MR. STEINTHAL:

10 Q. When you say that "Google knows the
11 prices," I want you to be more precise. Can you
12 define me what precisely Google and the prices?

13 A. Advertisers now, for the most part -- not
14 purely but we're talking about -- they place
15 their bids for when they're willing the pay for
16 an ad based on a click. You know, when an ad is
17 clicked on, that's when they -- you know, that's
18 when they get paid. That's when they pay.

19 Google [REDACTED]

[REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]

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1 You said that -- you referred to an auction in
2 which Google is competing against other bidders;
3 is that correct?

4 MR. HILLEGAS: Objection; form.

5 THE WITNESS: So I'd like to refer
6 to my report.

7 BY MR. STEINTHAL:

8 Q. Sure.

9 A. Page 11, Figure 1. This is a high-level
10 model of components of systems, and so we're
11 saying [REDACTED]

[illegible]

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1 [REDACTED]

10 [REDACTED]

14 Q. And when you say Google's participating
15 in the auction the others are participating in,
16 the auction is the one run by Google's ad
17 exchange, correct?

18 MR. HILLEGAS: Objection; form.

19 THE WITNESS: We're talking about in
20 the [REDACTED], the one
21 that's used, you know, if we're taught the
22 specific components in my report. I can go
23 through that.

24 BY MR. STEINTHAL:

25 Q. I'm confused by that answer, Professor.

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[illegible]

12 Q. So the auction in which Google
13 advertisers indirectly -- strike that.

14 You referred to an auction in which
15 Google competes with non-Google bidders,
16 correct.

17 A. Yes.

18 Q. And when you're referring to Google in
19 that concept, you mean the Google buying tools,
20 like Google Ads and Google 360?

21 A. I'm referring specifically to [REDACTED]

40 (Pages 154 - 157)

Page 160

1 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[illegible]

12 [REDACTED]
[REDACTED]
[REDACTED]

5 MR. HILLEGAS: Objection; form.

6 THE WITNESS: [REDACTED]

[REDACTED]

8 Q. [REDACTED]

9 A. [REDACTED]

10 Q. [REDACTED]



Response	Percentage
U.S. should take action to address climate change	95%
U.S. should not take action to address climate change	5%
U.S. should take action to address climate change	90%
U.S. should not take action to address climate change	10%
U.S. should take action to address climate change	85%
U.S. should not take action to address climate change	15%
U.S. should take action to address climate change	80%
U.S. should not take action to address climate change	20%
U.S. should take action to address climate change	75%
U.S. should not take action to address climate change	25%
U.S. should take action to address climate change	70%
U.S. should not take action to address climate change	30%
U.S. should take action to address climate change	65%
U.S. should not take action to address climate change	35%
U.S. should take action to address climate change	60%
U.S. should not take action to address climate change	40%
U.S. should take action to address climate change	55%
U.S. should not take action to address climate change	45%
U.S. should take action to address climate change	50%
U.S. should not take action to address climate change	50%

22 MR. HILLEGAS: Objection; form.

23 THE WITNESS: [REDACTED]

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1 [REDACTED]

3

1 [REDACTED]

17 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

4 Q. [REDACTED]

5 A. [REDACTED]

16

24 [REDACTED]
[REDACTED]

24 Q. And the value of the ad impression is it
25 could buy advertising, can it not?

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1 MR. HILLEGAS: Object; form.
2 THE WITNESS: To Google, the value
3 of an ad impression is the price they'll be
4 paid -- whether someone is going to click on it,
5 the probability is going to be clicked on for
6 this given -- this given publisher and how much
7 they're going to get paid for it. That's what
8 determines the value for them.
9 The probability -- how much they're
10 going to get paid for the click, they know that.
11 The probability that it's going to be clicked on is
12 amazingly complex to calculate because you're
13 literally trying to predict what a person is
14 going to do in a particular context at the point
15 of, you know, reading a particular web page with
16 some particular history, some demographic
17 whatever, just showing them this ad from this
18 particular publisher -- this advertising, are they
19 going to -- are they going to click it or not?
20 That's what determines -- that's how
21 the valuing is to Google and that's what
22 determines what they're willing to pay. [REDACTED]

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1 [REDACTED]
2 BY MR. STEINTHAL:
3 Q. But I didn't ask you about the value of
4 the Google. I asked you the value of an
5 advertiser. So isn't the value to be if -- if
6 [REDACTED] --
7 A. Uh-huh.
8 Q. -- it's bidding on the value its
9 advertisers place on the impression, correct?
10 MR. HILLEGAS: Objection to form.
11 THE WITNESS: Third-party bidders
12 get BidRequest as a set of information, and they
13 go, like, based on this, do I want to place a
14 bid? And -- and they say, Yeah, I want to place
15 for this. The information we're talking -- the
16 information about, they do but -- strike that.
17 I'm sorry.
18 The information difference in this
19 context is really about the value of the ad, [REDACTED]

Because -- so when we say

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1 [REDACTED]
2 [REDACTED]
3 [REDACTED]
4 [REDACTED]
5 [REDACTED]
6 [REDACTED]
7 [REDACTED]
8 [REDACTED]
9 [REDACTED]
10 [REDACTED]
11 [REDACTED]
12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 MR. STEINTHAL: Thanks for bearing
16 with me. It's been a little longer than an
17 hour. We're taking a break. You want to take
18 10, 15 minutes?
19 MR. HILLEGAS: Yes, please.
20 THE VIDEOGRAPHER: We're going off
21 the record at 2:05:00 p.m.
22 (Brief break was observed.)
23 THE VIDEOGRAPHER: We're going back
24 on the record at 2:25 p.m.
25 BY MR. STEINTHAL:

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1 Q. Okay. Professor, we spoke earlier about
2 information balance and we can try to explore
3 that a little bit more now. As initial matters
4 to the one same page as terminology, would you
5 describe the information balance as a theory, a
6 state, a concept? What words would you describe
7 it?
8 MR. HILLEGAS: Objection to form.
9 THE WITNESS: So in paragraph 21,
10 when I say, "I explore the assertion by
11 examining the question of information on
12 balance," in this report, I defined it to mean
13 the difference -- to mean that different parties
14 possess different knowledge or amounts of
15 knowledge in the context of any given ad
16 auction.
17 BY MR. STEINTHAL:
18 Q. I guess I'm asking a little more mundane.
19 If I were to say -- if I were to refer to
20 your theory of information balance -- I don't
21 want to be putting words in your mouth.
22 Is it a theory? Is it a concept of --
23 just, what now would you describe it if I was
24 trying to ask you a question about it?
25 MR. HILLEGAS: Objection to form.

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1 THE WITNESS: My opinion is not
2 about a general theory of information and
3 balance. It's very specific in the context of
4 an auction which I define here.
5 BY MR. STEINTHAL:
6 Q. Okay. So does this concept information
7 and balance as you describe it, have any
8 application outside of ad auctions?
9 MR. HILLEGAS: Objection; form.
10 THE WITNESS: The term "information"
11 and "balance," you know, is inherently ambiguous
12 and broad. I'm -- in the context of this, I'm
13 talking about the context of ad auctions.
14 BY MR. STEINTHAL:
15 Q. So as you just said in paragraph 21, you
16 define information and balance as being a
17 situation in which, quote, different parties
18 possess different knowledge or offer amounts of
19 knowledge in the context of any given ad
20 auction; is that correct?
21 MR. HILLEGAS: Objection; form.
22 THE WITNESS: That appears to be
23 what I said.
24 BY MR. STEINTHAL:
25 Q. Is that what you meant to say?

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1 A. It is.
2 Q. And you define the parties with, quote,
3 relatively more knowledge or more detailed
4 knowledge as having a sufficient advantage; is
5 that correct?
6 MR. HILLEGAS: Objection to form.
7 THE WITNESS: That is what I say in
8 paragraph 22 in part.
9 BY MR. STEINTHAL:
10 Q. And conversely, those parties, quote,
11 with relatively less knowledge or less detailed
12 knowledge, quote, they have information
13 disadvantage; is that correct?
14 MR. HILLEGAS: Objection; form.
15 THE WITNESS: That is part of what I
16 say in the rest of paragraph 22.
17 BY MR. STEINTHAL:
18 Q. Is it meaningful to speak about a
19 particular parties' information advantage or
20 disadvantage by itself, or do you have -- is it
21 in relation to some other party?
22 MR. HILLEGAS: Objection; form.
23 THE WITNESS: The concept of
24 advantage, you know, information advantage or
25 information disadvantage is a relative term with

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<p style="text-align: right;">Page 170</p> <p>1 respect to another entity. 2 BY MR. STEINTHAL: 3 Q. And if there is one or more parties with 4 an advantage or disadvantage, that necessarily 5 means there is information imbalance as you use 6 that term, correct? 7 MR. HILLEGAS: Objection. 8 THE WITNESS: Yes. 9 BY MR. STEINTHAL: 10 Q. In your opinion, does the existence of 11 information imbalance have any theoretical 12 consequences or implications? 13 MR. HILLEGAS: Objection to form. 14 THE WITNESS: I don't offer an 15 opinion about the theoretical nature of 16 information balance or imbalance here. It's 17 very much in this context. 18 BY MR. STEINTHAL: 19 Q. Does it have any -- in your opinion, does 20 the existence of information and imbalance have 21 any practical consequences or implications? 22 MR. HILLEGAS: Objection; form. 23 THE WITNESS: I think information 24 imbalance is of particular relevance in the 25 context of this case. I don't offer an opinion</p>	<p style="text-align: right;">Page 172</p> <p>1 So I do take a position with respect 2 to how that information balance affects that. 3 BY MR. STEINTHAL: 4 Q. So there are some implications that you 5 are testifying about? 6 MR. HILLEGAS: Objection; form. 7 THE WITNESS: My report describes 8 the information, you know, differences, the 9 advantage and disadvantage and describes it in 10 the context of responding to Dr. Milgrom saying 11 that experiments can be done to -- the 12 implication can be done to negate that 13 information advantage. So my report is, by 14 responding to that, is saying the experiments 15 are not sufficient. 16 BY MR. STEINTHAL: 17 Q. Is it inherently undesirable for a party 18 to have a information disadvantage? 19 MR. HILLEGAS: Objection to form. 20 THE WITNESS: I don't offer an 21 opinion about the desirability or undesirability 22 of things in this context. 23 BY MR. STEINTHAL: 24 Q. If there are two parties one with more 25 information and one with less information, is</p>
<p style="text-align: right;">Page 171</p> <p>1 outside of that. 2 BY MR. STEINTHAL: 3 Q. So what I'm trying to understand is 4 whether information and imbalance, as you used 5 that term in your report, just describes a state 6 of certain people, certain parties, having more 7 information than others, or are there 8 consequences that flow from that advantage? 9 MR. HILLEGAS: Objection; form. 10 THE WITNESS: My report is about the 11 information imbalance in this particular, you 12 know, Google's auction system. My report does 13 not go in detail about the consequences of that 14 imbalance. 15 BY MR. STEINTHAL: 16 Q. So you're not offering any opinions in 17 this case about the consequence of that 18 imbalance? 19 MR. HILLEGAS: Objection to form. 20 THE WITNESS: My report is talking 21 about information balance and how it can effect 22 the different parties' ability to understand 23 what's happening and use experiments to 24 understand how the systems behave. That's the 25 basis of my rebuttal to Dr. Milgrom.</p>	<p style="text-align: right;">Page 173</p> <p>1 the party with less information always worse 2 off? 3 MR. HILLEGAS: Objection to form. 4 THE WITNESS: Connecting information 5 advantage or disadvantage to particular concrete 6 economic outcomes is outside the scope of my 7 report. 8 BY MR. STEINTHAL: 9 Q. The definition that you offered for 10 information balance refers to the context of any 11 given ad auction; is that just because that's 12 the example in this case; or do you believe your 13 opinions are, in fact, specific to the context 14 of the ad auctions? 15 MR. HILLEGAS: Objection; form. 16 THE WITNESS: My opinions here are 17 about the code of Google's ad systems and how 18 they work. So the description of the 19 information advantage or disadvantage is in the 20 context of that code. I do not offer an opinion 21 on the general nature of that in other systems, 22 ad systems or otherwise. 23 BY MR. STEINTHAL: 24 Q. So if we change the facts of this case 25 that instead of it being at Google, which</p>

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<p style="text-align: right;">Page 174</p> <p>1 auctions ads, it was instead about E-Bay, which 2 auctions physical memorabilia and physical 3 objects, everything else is the same, E-Bay had 4 all the same information advantages that Google 5 has and everyone has the same disadvantages that 6 others had (inaudible) -- all that changed 7 instead of auctioning ads, we're auctioning 8 memorabilia, would your opinions still hold? 9 MR. HILLEGAS: Objection; form. 10 THE WITNESS: If the -- if my 11 observations were about the code, so if the code 12 was identical, then my conclusions would still 13 hold. However, I do not see how the code would 14 be identical [REDACTED] [REDACTED] So 16 I don't really see how it would be exactly the 17 same for other auction systems. 18 BY MR. STEINTHAL: 19 Q. So I take it that if you ask -- if I ask 20 this question about, say, an offline auction for 21 art, you would say it would also be materially 22 different, correct? 23 MR. HILLEGAS: Objection; form. 24 THE WITNESS: I would say that the 25 source code of the system I inspected was</p>	<p style="text-align: right;">Page 176</p> <p>1 what's being said there in terms of doing 2 experiments and in terms of the parts of the 3 auction being kept secret, and in the context of 4 having access to the source code of Google, I 5 then go, experiments about this (indicating); 6 how much can the experiments tell me about this 7 artifact and about how it works; and just at an 8 intuitive level I kind of go, that seems like a 9 challenging thing. And so then I went let me -- 10 so let's see, it could be okay if everyone was 11 getting the same information. Then I would say, 12 okay, it's a standard auction, everyone gets the 13 same information, everyone can operate on even 14 playing field. But is that the case? And so I 15 started looking at how the auction works and 16 seeing, [REDACTED] [REDACTED] 19 And so it's really starting with looking 20 at Dr. Milgrom and going, like, what is he 21 saying and trying to understand what that means, 22 and then going, I don't agree with this and 23 trying to understand why I don't agree with it. 24 And when it comes down to why I don't agree with 25 it, it's trying to understand -- I don't think</p>
<p style="text-align: right;">Page 175</p> <p>1 [REDACTED] [REDACTED] 4 I cannot speak about whether the observations I 5 have of that would apply to systems that may or 6 may not be similar in other economic contexts. 7 BY MR. STEINTHAL: 8 Q. I think I might have asked this question 9 earlier but I'll try it again. 10 What led you to consider information 11 imbalance as a theory for understanding a 12 response to Dr. Milgrom's report? 13 A. So am I to understand how I -- how did I 14 go from the assignment in paragraph two to the 15 information imbalance I discussed later in my 16 report? 17 Q. I'm trying to understand what led you to 18 start thinking about information imbalance in 19 this case? 20 A. So in reading Dr. Milgrom's report and 21 the specific sections on experimentation, so 22 when I first read it, I kind of looked at it and 23 I go, huh, is this right; and I start thinking, 24 if I think it's not right, why is it not right. 25 And so then I take and I try understanding</p>	<p style="text-align: right;">Page 177</p> <p>1 these experiments tell you as much and then why 2 don't they tell you as much in the context of 3 the code. Well, they aren't -- they can't give 4 you any information. 5 Q. Do you discuss information imbalance in 6 any of your published academic papers? 7 MR. HILLEGAS: Objection to form. 8 THE WITNESS: I proposed models of 9 the battles between attackers and defenders, 10 sand part of that model, part of some of the 11 models I've talked about actually with a recent 12 Ph.D. student is about knowledge reviews, and so 13 the idea that a attackers attempt to generate 14 new knowledge in order to, you know, attempt to 15 understand the new knowledge and then defenders 16 attempt to invalidate that knowledge. So in 17 that context, I have written about information 18 imbalance between attackers and defenders and 19 attackers trying to gain information imbalance 20 advantage and defenders trying to invalidate 21 that information advantage. 22 BY MR. STEINTHAL: 23 Q. And is that information imbalance similar 24 to the imbalance that you discuss in your 25 report?</p>

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<p style="text-align: right;">Page 178</p> <p>1 MR. HILLEGAS: Objection; form.</p> <p>2 THE WITNESS: I would say the kind</p> <p>3 of information that we're talking about here is</p> <p>4 there's so much agreed there complex adaptive</p> <p>5 systems (as said), but beyond that, they are</p> <p>6 quite different.</p> <p>7 BY MR. STEINTHAL:</p> <p>8 Q. Because you said earlier that information</p> <p>9 imbalance described in your report is only</p> <p>10 applicable in the context of online ad auctions,</p> <p>11 correct?</p> <p>12 MR. HILLEGAS: Objection to form.</p> <p>13 THE WITNESS: I'm only offering an</p> <p>14 opinion on information imbalance in the context</p> <p>15 of this particular ad auction system.</p> <p>16 BY MR. STEINTHAL:</p> <p>17 Q. Are you aware of any other published</p> <p>18 papers in the field of computer science</p> <p>19 discussing information imbalance in the way that</p> <p>20 it is used in your report?</p> <p>21 MR. HILLEGAS: Objection to form.</p> <p>22 THE WITNESS: I am not aware of</p> <p>23 specific papers that discuss information</p> <p>24 imbalance the way I do, but I have not looked</p> <p>25 for papers that talk about this.</p>	<p style="text-align: right;">Page 180</p> <p>1 THE WITNESS: I do not cite academic</p> <p>2 literature in my report.</p> <p>3 BY MR. STEINTHAL:</p> <p>4 Q. Have you attended any professional</p> <p>5 conferences in the field of computer science</p> <p>6 that discusses information advantage or</p> <p>7 disadvantage?</p> <p>8 MR. HILLEGAS: Objection; form.</p> <p>9 THE WITNESS: I've written papers</p> <p>10 and worked with Ph.D. students on the</p> <p>11 information dynamic between attackers and</p> <p>12 defenders, so in that sense, yes. But more</p> <p>13 generally, I don't believe so.</p> <p>14 BY MR. STEINTHAL:</p> <p>15 Q. And your opinions in this case are</p> <p>16 limited to describing the existence and extent</p> <p>17 of this alleged information imbalance but not to</p> <p>18 opine on the consequences of that for publishers</p> <p>19 or advertiser, correct?</p> <p>20 MR. HILLEGAS: Object to form.</p> <p>21 THE WITNESS: My opinions on</p> <p>22 information advantage and disadvantage are in</p> <p>23 the context of rebutting Dr. Milgrom's</p> <p>24 assertions about experiments being able to allow</p> <p>25 participants to optimize their bids. So to that</p>
<p style="text-align: right;">Page 179</p> <p>1 BY MR. STEINTHAL:</p> <p>2 Q. Did you do a literature review as part of</p> <p>3 your work in this case?</p> <p>4 MR. HILLEGAS: Objection to form.</p> <p>5 THE WITNESS: I did not conduct a</p> <p>6 literature review as part of this.</p> <p>7 BY MR. STEINTHAL:</p> <p>8 Q. If such paper existed, would you want to</p> <p>9 cite it and bolster your opinion?</p> <p>10 MR. HILLEGAS: Objection to form.</p> <p>11 THE WITNESS: I did not conduct a</p> <p>12 literature review, because in the context of</p> <p>13 support, I was trying to understand a particular</p> <p>14 artifact and a how its particular dynamics were,</p> <p>15 and I wasn't claiming that my concepts of</p> <p>16 information imbalance were original.</p> <p>17 If I wanted to describe the history</p> <p>18 of information imbalance and literature, I would</p> <p>19 have done a literature imbalance and took these</p> <p>20 ideas and applied them to this particular</p> <p>21 system.</p> <p>22 BY MR. STEINTHAL:</p> <p>23 Q. In fact, there's no academic literature</p> <p>24 cited in your report at all for that reason?</p> <p>25 MR. HILLEGAS: Objection; form.</p>	<p style="text-align: right;">Page 181</p> <p>1 extent, I am, you know, the implication of what</p> <p>2 I'm doing apply to that, but not beyond that.</p> <p>3 BY MR. STEINTHAL:</p> <p>4 Q. But you haven't offered an opinion as to</p> <p>5 whether or not the information imbalance in this</p> <p>6 case the fact -- the information imbalance is</p> <p>7 beneficial for publishers or harmful for</p> <p>8 publishers?</p> <p>9 (Clarification by Reporter)</p> <p>10 Q. Have you offered an opinion in this case</p> <p>11 as to whether the information imbalance that you</p> <p>12 described in your report is beneficial for</p> <p>13 publishers or harmful for publishers?</p> <p>14 MR. HILLEGAS: Objection; form.</p> <p>15 THE WITNESS: I have not offered an</p> <p>16 opinion on advantages or disadvantages per se.</p> <p>17 BY MR. STEINTHAL:</p> <p>18 Q. And that would extent to advantages or</p> <p>19 disadvantages for advertisers as well, correct?</p> <p>20 MR. HILLEGAS: Objection; form.</p> <p>21 THE WITNESS: I do not offer an</p> <p>22 opinion for advertisers -- the advantage for</p> <p>23 advertisers either.</p> <p>24 BY MR. STEINTHAL:</p> <p>25 Q. Okay. For the next round of questions</p>

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<p style="text-align: right;">Page 182</p> <p>1 I'm trying to understand this concept a little 2 better, I have a series of hypotheticals and I'm 3 going to try to understand how your notion of 4 information advantage applies there. Just to 5 make sure we're on the same page, some 6 background questions. 7 Do you know what an advertiser buying 8 tools are? 9 A. Yes. 10 Q. And what are some examples of buying 11 tools? 12 A. I believe DV 360. 13 Q. And what's their principal purpose or 14 function? 15 MR. HILLEGAS: Objection; form. 16 THE WITNESS: Advertiser buying 17 tools are simply tools that advertisers use to 18 set bids for buying ads. 19 BY MR. STEINTHAL: 20 Q. And to essentially be automated bidders 21 to ad auctions, correct? 22 A. Yes. 23 Q. And are you familiar with what a 24 publisher ad server is? 25 A. I'm familiar with the basic term.</p>	<p style="text-align: right;">Page 184</p> <p>1 Exhibit 3, which contains -- just includes a 2 visual of some of the assumptions that I'm going 3 to make hypothetical. Just to be clear, the 4 copy that is marked with a sticker, the reporter 5 is going to take this exhibit, I have plenty of 6 other copies of it, and so if it would be 7 helpful for you to annotate, you know, as we go 8 to different facts. They're available for 9 anyone who wants them. We won't be taking them 10 back in the record. They will just be for 11 scratch paper if you want them. 12 A. I'll take one. 13 Q. Sure. 14 MR. STEINTHAL: If anyone is 15 interested, we have copies. I'll need one. 16 Thanks. 17 (Exhibit Number 3 was marked.) 18 BY MR. STEINTHAL: 19 Q. So I'm going to describe for you, as we 20 talk in hypotheticals, I want to assume a 21 simplified ad auction. That's simpler than the 22 ones that happened in the real world. Hopefully 23 to better understand the theory underlying this. 24 So as shown here in my simplified ad 25 auction, assume that there's only two</p>
<p style="text-align: right;">Page 183</p> <p>1 Q. Are publisher ad servers relevant to 2 advantage buffers in this case? 3 MR. HILLEGAS: Objection to form. 4 THE WITNESS: The opinions I offered 5 in this case are really centered around this 6 figure one on page 11, which is about the 7 internal systems, which price and chooses 8 specific ads and serve them out. 9 So I don't have an offered opinion 10 on the tools that input the data to the system, 11 which is what we're talking about by publisher 12 tools and advertiser tools. 13 BY MR. STEINTHAL: 14 Q. Do you know what an ad exchange is? 15 A. Yes. 16 Q. What's an ad exchange? 17 A. An ad exchange is basically, in the 18 context of this, an auction place for. yeah. 19 Q. If at any point in these questions, the 20 definition of these terms are unclear, you'll 21 ask for clarification? 22 A. Yes. 23 Q. Okay. To make the following questions 24 hopefully a little bit easier, I'm going to hand 25 you a document that's been marked Somayaji</p>	<p style="text-align: right;">Page 185</p> <p>1 advertisers for any particular ad, Coke and 2 Pepsi. They can each bid through buying tools A 3 and B. You can imagine that A is 60 and B is 4 The Trade Desk. These are hypothetical abstract 5 bidding tools. Okay. And similarly, they're 6 bidding for ad space on a single website. For 7 simplicity, I called the Dallas Morning News in 8 the State of Texas via Google. It doesn't make 9 a difference who the publishers is. Okay. 10 And then there is a single ad exchange 11 that the Dallas Morning News is selling on, and 12 finally, just for simplicity, let's assume 13 there's a single human user viewing these ads 14 through only one browser. There's just one 15 user. The user is the one that sees the add on 16 the page. 17 A. Okay. 18 Q. And none of these examples have anything 19 to do with a particular company like Google or 20 anything. I used Coke and Pepsi just because we 21 understand what soft drinks are, but there's 22 nothing specific to that. 23 Does that make sense? 24 A. Yes. 25 Q. Okay. Great. So for my first</p>

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<p style="text-align: right;">Page 186</p> <p>1 hypothetical scenario, let's assume that the ad 2 exchange doesn't receive any information about 3 the user. It doesn't have a cookie. It just 4 knows what the Web page is and it sends the 5 exact same information to each of the buying 6 tools A and B.</p> <p>7 In that scenario, would you say that 8 there's an information imbalance?</p> <p>9 MR. HILLEGAS: Objection; form.</p> <p>10 THE WITNESS: So if there is no -- 11 if the ad exchange is sending the same 12 information to buying tools -- pause.</p> <p>13 It's a little funny how you've 14 written this diagram because in my mind the 15 tools A and B would have input information in 16 the ad exchange and it would have just processed 17 things there. Like it's really just loading up 18 a database that the exchange is using as opposed 19 to going back and forth.</p> <p>20 But if I say that this ad exchange 21 is offering to the agents from buying tool A and 22 B, which have been produced, which make a 23 decision about whether to buy it or not -- if 24 the information provided to both is the same, 25 then the ad exchange is not giving one or the</p>	<p style="text-align: right;">Page 188</p> <p>1 MR. HILLEGAS: Objection; form.</p> <p>2 THE WITNESS: I think the confusion 3 comes up, it's just in terms of when you say 4 "buying tool," I'm also, in my mind, thinking 5 about the tool that, you know, an advertiser is 6 using in front of them to place this, and so 7 that system is not involved in the realtime 8 decision. But if -- but the portion of the tool 9 that's involved in the actual decision making, 10 let's assume that, I'll assume that's what the 11 tool is for now, so I'll just repeat...</p> <p>12 BY MR. STEINTHAL:</p> <p>13 Q. Is your answer complete?</p> <p>14 A. So my understanding of the model is that 15 the BidRequest would come from the ad exchange 16 to these two tools. They would evaluate it. 17 Decided if, you know, what price they wanted to 18 set, and that would come back to the ad exchange 19 where it would decide which one was higher.</p> <p>20 Q. And so just to review. If the BidRequest 21 sent to A and B have the exact same information, 22 you would say there is no information imbalance 23 in this case, correct?</p> <p>24 A. Created by -- so there's no information 25 imbalance created by the ad exchange. I</p>
<p style="text-align: right;">Page 187</p> <p>1 other an information advantage.</p> <p>2 BY MR. STEINTHAL:</p> <p>3 Q. I'm going to dig at that a little bit. 4 In your report you talk extensively about the 5 information that is shared by Google ad 6 exchange with both Google buying tools and 7 non-Google buying tools, correct?</p> <p>8 A. Yes.</p> <p>9 MR. HILLEGAS: Objection to form.</p> <p>10 BY MR. STEINTHAL:</p> <p>11 Q. And the reason, as I understand it, is 12 that as you observe the ad exchange sends 13 BidRequest messages through some network 14 protocol to the different buying tools saying -- 15 strike that.</p> <p>16 Imagine for an example that we ignore the 17 buying tools. Let's talk about only third-party 18 buying tool for a second. Okay. So let's say A 19 and B are each third-party buying tools bidding 20 into Google's exchange. As I understood in your 21 report, the exchange sends bid requests messages 22 to A and B for each auction so that A and B can 23 decide what they want to bid and return bid 24 responses to the exchange; is that your 25 understanding of the model?</p>	<p style="text-align: right;">Page 189</p> <p>1 couldn't speak to the absolute information 2 balance between the parties because maybe they 3 know something else from other channels.</p> <p>4 Q. And in your report when you refer to 5 information imbalance in this case, are you 6 referring information imbalance in the absolute 7 sense, or information imbalance caused by a 8 particular actor?</p> <p>9 MR. HILLEGAS: Objection; form.</p> <p>10 THE WITNESS: I'm talking about the 11 information imbalance caused by the Google tools 12 exchanging information to internal versus 13 external parties.</p> <p>14 BY MR. STEINTHAL:</p> <p>15 Q. Now, for a second scenario dealing with 16 the same facts as the first one except this time 17 the ad exchange does know who the user is, it's 18 able to read a cookie from the browser and it 19 has some sense who the user is, but it does not 20 share that information with either buying tool; 21 it keeps it to itself.</p> <p>22 So the information in A and B is the 23 same; it just does not include the ad exchange 24 that A and B don't, is there an information 25 imbalance in that case?</p>

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<p style="text-align: right;">Page 190</p> <p>1 MR. HILLEGAS: Objection; form.</p> <p>2 THE WITNESS: If I assume the ad</p> <p>3 exchange is only comparing the values between</p> <p>4 the buying tools and is otherwise is not making</p> <p>5 any other decisions, so like A and B are fixed.</p> <p>6 They're are being chosen from an universe of</p> <p>7 ones by the ad exchange, they are just -- they</p> <p>8 are also the only two that are bidding and the ad</p> <p>9 exchange has additional information that is not</p> <p>10 being passed on, but the information that is</p> <p>11 being passed on is the same between the two --</p> <p>12 then, again, there's no difference in</p> <p>13 information advantage.</p> <p>14 BY MR. STEINTHAL:</p> <p>15 Q. Third one, so now the ad exchange does</p> <p>16 share that cookie information with A and with B,</p> <p>17 but A has seen that cookie before, so A has some</p> <p>18 concept based on that cookie. B has not. Is</p> <p>19 there information advantage between A and B in</p> <p>20 that case?</p> <p>21 MR. HILLEGAS: Objection; form.</p> <p>22 BY MR. STEINTHAL:</p> <p>23 Q. Sorry. Let me rephrase the ending of</p> <p>24 that question. Is there information imbalance</p> <p>25 between A and B in that case?</p>	<p style="text-align: right;">Page 192</p> <p>1 advantage or disadvantage or neither based on</p> <p>2 the facts in this scenario?</p> <p>3 MR. HILLEGAS: Object to form.</p> <p>4 BY MR. STEINTHAL:</p> <p>5 Q. Or you can't know?</p> <p>6 A. I'm not sure exactly which -- you</p> <p>7 described a couple of scenarios. I'm not sure</p> <p>8 exactly of the specifics of the one you want me</p> <p>9 to talk about here.</p> <p>10 Q. We will try it again and go back and</p> <p>11 refresh it.</p> <p>12 A. Okay.</p> <p>13 Q. So in this example, the ad exchange</p> <p>14 shares a cookie identifier with both buying tool</p> <p>15 A and buying tool B. Buying tool A is able to</p> <p>16 use that to look up in its profile database</p> <p>17 information about the user; B is not.</p> <p>18 And my question is whether that -- and</p> <p>19 we've established that that, you said earlier,</p> <p>20 that in an absolute sense A has an advantage</p> <p>21 over B, but it wasn't caused by the exchange,</p> <p>22 correct?</p> <p>23 MR. HILLEGAS: Objection; form.</p> <p>24 THE WITNESS: If we assume that both</p> <p>25 A and B can understand such cookies and have a</p>
<p style="text-align: right;">Page 191</p> <p>1 A. So in the absolute sense clearly A has</p> <p>2 more information than B. But in the context of</p> <p>3 how -- whether the ad exchange created</p> <p>4 information imbalance between the parties and</p> <p>5 you could philosophically say, oh, I exchanged</p> <p>6 the cookie and so one could make use of it and</p> <p>7 one couldn't.</p> <p>8 But in principal, if B could have that</p> <p>9 same information, then it's, like, you just</p> <p>10 don't happen to have that information, so we can</p> <p>11 say the ad exchange didn't create that imbalance</p> <p>12 because they could have plausibly had</p> <p>13 information on that cookie, you know,</p> <p>14 information on that user just as much as A had.</p> <p>15 Q. And is it -- are Coke or Pepsi in this</p> <p>16 example, at an advantage or disadvantage?</p> <p>17 MR. HILLEGAS: Objection; form.</p> <p>18 THE WITNESS: So your question is</p> <p>19 that -- is Coke or Pepsi at at advantage or</p> <p>20 disadvantage in this scenario?</p> <p>21 BY MR. STEINTHAL:</p> <p>22 Q. Yes. My question is, again, in your</p> <p>23 report you discuss advertisers being information</p> <p>24 disadvantages. I'm asking if the advantages in</p> <p>25 this case here, Coke or Pepsi, are at an</p>	<p style="text-align: right;">Page 193</p> <p>1 database of it, that is, you know, the exchange</p> <p>2 can plausible say they have similar utility --</p> <p>3 similar ability to use the knowledge that has</p> <p>4 been granted to them, then I would say the ad</p> <p>5 exchange isn't created information imbalance</p> <p>6 between them.</p> <p>7 BY MR. STEINTHAL:</p> <p>8 Q. And then my question is -- I move the</p> <p>9 level of Coke or Pepsi, do they have any -- do</p> <p>10 either of them have any meaningful information</p> <p>11 advantage against the other or against buying</p> <p>12 tools for the exchange?</p> <p>13 MR. HILLEGAS: Objection to form.</p> <p>14 THE WITNESS: If Coke knows who the</p> <p>15 user is and Pepsi doesn't know who the user is,</p> <p>16 Coke has an advantage.</p> <p>17 BY MR. HILLEGAS:</p> <p>18 Q. So if in Coke the user is buying tool A</p> <p>19 and in Pepsi the user is buying tool B, you'd</p> <p>20 say Coke has an advantage because A know the</p> <p>21 user and B does not?</p> <p>22 MR. HILLEGAS: Objection to form.</p> <p>23 THE WITNESS: If Coke knows the</p> <p>24 user, you know, the buying tool A know the user</p> <p>25 and the buying tool Pepsi does not know the</p>

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<p style="text-align: right;">Page 194</p> <p>1 user, then yes.</p> <p>2 BY MR. STEINTHAL:</p> <p>3 Q. Even if B knows the user in the sense</p> <p>4 that it has the identifier but just no</p> <p>5 information about the user, same result?</p> <p>6 MR. HILLEGAS: Objection; form.</p> <p>7 THE WITNESS: If I assume everything</p> <p>8 else is equal, then I think so. But I would</p> <p>9 have to -- but it's -- but I would really have</p> <p>10 to assume the playing field level in every other</p> <p>11 way.</p> <p>12 BY MR. STEINTHAL:</p> <p>13 Q. And if I relax the assumption that Coke</p> <p>14 user is A and Pepsi user is B, and just say,</p> <p>15 Coke or Pepsi could choose whichever one they</p> <p>16 want, is Pepsi still at a disadvantage in that</p> <p>17 scenario?</p> <p>18 MR. HILLEGAS: Objection; form.</p> <p>19 THE WITNESS: When we talk about the</p> <p>20 information advantage, it's not talking about</p> <p>21 information in any specific interaction. It's</p> <p>22 normally talking about some sort of systematic,</p> <p>23 you know, general advantage or, you know,</p> <p>24 disadvantage. Some general cap- -- so talking</p> <p>25 about in the context, if you equalize</p>	<p style="text-align: right;">Page 196</p> <p>1 And my question is: This seems to be</p> <p>2 defining information imbalance with respect to</p> <p>3 specific ad auctions and you just testified, if</p> <p>4 I understood you correctly, that it's not about</p> <p>5 any specific interaction; it's more a general</p> <p>6 state?</p> <p>7 A. In the simpler scenario, when we talk</p> <p>8 about everything being even, I can talk about</p> <p>9 the information advantage, because I can</p> <p>10 understand what information every party had.</p> <p>11 When we get into these scenarios, where</p> <p>12 we start saying, you know, you can choose which</p> <p>13 exchange, you can do this -- it's like, then,</p> <p>14 you have to really figure out who knows what in</p> <p>15 what context, and it's like, it's very hard to</p> <p>16 say what the overall advantage is because you</p> <p>17 basically have to an analysis of possible</p> <p>18 outcomes. Like you have to do a matrix and say,</p> <p>19 okay, in this scenario, would I have to measure</p> <p>20 it in bits or something like that, and it's</p> <p>21 like, that -- so that's why in the definition</p> <p>22 here we're talking about -- any given ad auction</p> <p>23 is talking about in a general pattern.</p> <p>24 Q. Okay. And I'm speaking more generally of</p> <p>25 this, just looking at this diagram more</p>
<p style="text-align: right;">Page 195</p> <p>1 everything, okay, that has a little bit</p> <p>2 advantage, but when we start generalizing the</p> <p>3 interactions, it starts losing its meaning,</p> <p>4 because you are then having to do an economic</p> <p>5 assessment of who knows more for each party and</p> <p>6 information advantage or disadvantage is talking</p> <p>7 about more general properties.</p> <p>8 BY MR. STEINTHAL:</p> <p>9 Q. So I -- you just testified when we talk</p> <p>10 about information advantage, we're not talking</p> <p>11 about a specific interaction. Instead it's more</p> <p>12 a general advantage. How does that square up</p> <p>13 with your report in paragraph 21 when you refer</p> <p>14 to different parties possessing different</p> <p>15 knowledge or amounts of knowledge in the context</p> <p>16 at any given ad auction?</p> <p>17 MR. HILLEGAS: Objection; form.</p> <p>18 THE WITNESS: Which paragraph again?</p> <p>19 BY MR. STEINTHAL:</p> <p>20 Q. So 21 about four lines down of the</p> <p>21 paragraph, you're defining information balance</p> <p>22 it says, quote, which in this report, I define</p> <p>23 to mean that different parties possess different</p> <p>24 knowledge or amounts of knowledge in the context</p> <p>25 of any given ad auction."</p>	<p style="text-align: right;">Page 197</p> <p>1 generally, we've spoken about information</p> <p>2 advantage, has a disadvantage A relative to B or</p> <p>3 Coke relative to Pepsi.</p> <p>4 Is it meaningful to also ask about</p> <p>5 information advantages between -- or</p> <p>6 horizontally in this example. So we're talking</p> <p>7 about information advantage between a buying</p> <p>8 tool and the exchange or between an advertiser</p> <p>9 and a buying tool; is that meaningful concept,</p> <p>10 or do you have to look between peers?</p> <p>11 MR. HILLEGAS: Object to form.</p> <p>12 THE WITNESS: If I were to map this</p> <p>13 scenario to the one I'm discussing in the</p> <p>14 context of Google, I would have to be talking</p> <p>15 about many different advertisers with the ad</p> <p>16 exchange choosing which advertiser to permit,</p> <p>17 you know, to participate, and then also setting</p> <p>18 the prices for -- for most of the them versus</p> <p>19 the other ones it does not set prices for. So</p> <p>20 it starts looking like a very different picture</p> <p>21 because the exchange is taking a much more</p> <p>22 active role.</p> <p>23 BY MR. STEINTHAL:</p> <p>24 Q. And that's your understanding of the</p> <p>25 facts of this case?</p>

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<p style="text-align: right;">Page 198</p> <p>1 MR. HILLEGAS: Objection; form.</p> <p>2 THE WITNESS: My understanding is</p> <p>3 the exchange is being much more than just a</p> <p>4 simple running an auction.</p> <p>5 BY MR. STEINTHAL:</p> <p>6 Q. The description you just gave, though, of</p> <p>7 what would have to change in the words described</p> <p>8 in your report is drawn from your understanding</p> <p>9 of what the facts of this case are, correct?</p> <p>10 A. Yes.</p> <p>11 Q. Try a different one. All the same facts</p> <p>12 previously, the user -- one user, the exchange</p> <p>13 has a cookie that it draws from the user's</p> <p>14 browser, it passed it through A and B; A and B</p> <p>15 both have information about the user. They've</p> <p>16 both seen it. But A has twice as much</p> <p>17 information has a much more deeper knowledge,</p> <p>18 sees more transactions than B.</p> <p>19 Does A have a disadvantage relative to B?</p> <p>20 MR. HILLEGAS: Objection to form.</p> <p>21 THE WITNESS: When we talk about</p> <p>22 some parties having differing information about</p> <p>23 the scenario than other parties, the relevant</p> <p>24 question is not how much information one party</p> <p>25 has versus the other party.</p>	<p style="text-align: right;">Page 200</p> <p>1 publisher, in our case it's Dallas Morning News,</p> <p>2 has configured the ad exchange to share the</p> <p>3 cookie identifier only with buying tool B but</p> <p>4 not buying tool A.</p> <p>5 In that case is there information</p> <p>6 advantage between A and B?</p> <p>7 MR. HILLEGAS: Objection; form.</p> <p>8 THE WITNESS: If I assume all else</p> <p>9 is equal, buying tool B now can identify the</p> <p>10 user. Buying tool A cannot. That would</p> <p>11 represent an information advantage for buying</p> <p>12 tool B.</p> <p>13 BY MR. STEINTHAL:</p> <p>14 Q. Under the assumption that the identifier</p> <p>15 user is material to the --</p> <p>16 A. Yeah, under the assumption that the</p> <p>17 identifier user is material to make that</p> <p>18 decision, which is normally the thing in</p> <p>19 advertising.</p> <p>20 Q. And that's true even though in this</p> <p>21 absolute sense A has more information than B</p> <p>22 available but it just can't access it, so it's</p> <p>23 at its disadvantage?</p> <p>24 MR. HILLEGAS: Objection; form.</p> <p>25 THE WITNESS: So when we talk about</p>
<p style="text-align: right;">Page 199</p> <p>1 It's really about whether the</p> <p>2 information is relevant to the decision to be</p> <p>3 made. And so in the context here, what, you</p> <p>4 know, Coke and Pepsi have to figure out is</p> <p>5 how -- what's the value to them of this</p> <p>6 particular ad impression, and then based on that</p> <p>7 value, they can determine what price they're</p> <p>8 willing pay for it. That value determination is</p> <p>9 inherently complicated. Right. So it's not</p> <p>10 just like buying tool may have very little</p> <p>11 information but it's the right information, and</p> <p>12 it will say, oh, this is exactly the customer we</p> <p>13 would want to get things in front of. They're</p> <p>14 just about to -- you know, they're thinking</p> <p>15 about Pepsi but they've been trying to decide</p> <p>16 whether to go for Coke or Pepsi. And so we can</p> <p>17 put this here and we can persuade them to buy</p> <p>18 Coke, and now Pepsi has lots of information to</p> <p>19 this user but they can't make this decision. So</p> <p>20 all of a sudden, you know, it becomes more</p> <p>21 valuable to Coke versus Pepsi; but it's that</p> <p>22 relevance, which is tied to so many factors.</p> <p>23 BY MR. STEINTHAL:</p> <p>24 Q. Okay. Another example, same facts as the</p> <p>25 previous hypothetical except that we got the</p>	<p style="text-align: right;">Page 201</p> <p>1 information advantage, it's not about absolute</p> <p>2 information. It's about whether you have the</p> <p>3 right information. So if there's an anonymous</p> <p>4 ad request versus an ad request for a specific</p> <p>5 user, those are different things. Oh, this is a</p> <p>6 user who's never buying anything versus who</p> <p>7 knows what this is, that's different.</p> <p>8 BY MR. STEINTHAL:</p> <p>9 Q. And A has -- sorry, B has information</p> <p>10 advantage over A in this scenario, even though</p> <p>11 it was the publisher and not the ad exchange who</p> <p>12 made the decision as to who should get the</p> <p>13 information, correct?</p> <p>14 MR. HILLEGAS: Objection; form.</p> <p>15 THE WITNESS: The ad exchange is the</p> <p>16 one controlling the information that's going to</p> <p>17 these two parties. So it's the one setting up</p> <p>18 that information differential. The basis on</p> <p>19 which it's doing, yes, okay, there's this</p> <p>20 publisher who said it could do it, but they're</p> <p>21 doing it on the -- the ad exchange is the one</p> <p>22 who is actually acting to make the information</p> <p>23 difference.</p> <p>24 BY MR. STEINTHAL:</p> <p>25 Q. So you said the exchange caused the</p>

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<p style="text-align: right;">Page 202</p> <p>1 information advantage regardless of whether it 2 did so of its own -- or at its own initiative or 3 because it was asked by its customer? 4 MR. HILLEGAS: Objection; form. 5 THE WITNESS: The ad exchange is the 6 one that is interacting with the buying tools 7 specifically, and it will do actions on behalf 8 of itself or other parties. But if we're 9 talking about information advantage of A versus 10 B or looking at basically those arrows in the 11 hypothetical scenario. 12 BY MR. STEINTHAL: 13 Q. I believe you said earlier determining 14 the materiality of what information -- what 15 information material is a complex question, 16 correct? 17 A. Yes. 18 Q. Is it reasonable to assume that 19 complexity would increase if I went to two 20 advertisers or a thousand advertisers or ten 21 thousand advertisers? 22 A. The complexity of the problem is the 23 value for a particular advertiser, what's 24 relevant to them. The ad exchange question 25 becomes more complicated if he has to choose</p>	<p style="text-align: right;">Page 204</p> <p>1 A. If we're getting into the weeds about it, 2 it depends on how we're -- so I was talking 3 about information advantage in terms of is this 4 useful information for making this decision. I 5 don't know whether being a subscriber is useful 6 or not in the context of these advertisers. 7 Q. Right. You would need to know more about 8 whether or not that was actually useful to Coke 9 or to Pepsi? 10 A. Yes. 11 Q. And that's, of course, why I just asked 12 if that made more sense. If I, then, assumed 13 that they were not just Coke or Pepsi but there 14 were 10,000 different advertisers, you would 15 have to do more work to figure out whether that 16 piece of information is relevant to any of them 17 to answer the question, right? 18 MR. HILLEGAS: Objection; form. 19 THE WITNESS: When you added many 20 advertisers, it changes the nature of the 21 problem, because you could have a scenario where 22 you say everyone is bidding on it and so 23 everyone has to make that decision, but in order 24 for the system to scale, that's impossible. You 25 have to choose which advertisers are going to</p>
<p style="text-align: right;">Page 203</p> <p>1 which advertiser to bring in, but the value 2 calculation is separate from that. 3 Q. I asked that question out of order. That 4 doesn't make sense so I'm come back to that in a 5 second. 6 MR. HILLEGAS: We can take a small 7 break. 8 MR. STEINTHAL: No, it's fine. 9 BY MR. STEINTHAL: 10 Q. Let's assume in my next hypothetical that 11 the ad exchange share is exactly the same 12 information with A and B, same identifier, and 13 further that A and B have the exact same 14 information in their file about that user, a 15 hypothetical; but the Dallas Morning News, the 16 exchange shares on behalf of the morning news 17 with A but not B, one additional fact that the 18 user has been the subscriber for the Dallas 19 Morning News for the last three years, it's the 20 only information they have available to it. 21 Would you say A has an advantage over 22 B -- 23 MR. HILLEGAS: Objection; form. 24 BY MR. STEINTHAL: 25 Q. -- in that scenario?</p>	<p style="text-align: right;">Page 205</p> <p>1 bid and that choice has to be made by the ad 2 exchange, and so that adds in a level of 3 complexity and, frankly, control on the part of 4 the exchange and how the market operates. 5 BY MR. STEINTHAL: 6 Q. Okay. Before I go to the next 7 hypothetical, are you familiar with the concept 8 of remarketing or retargeting ads? 9 MR. HILLEGAS: Objection to form. 10 (Clarification by Reporter) 11 THE WITNESS: I don't recall the 12 precise definition. 13 BY MR. STEINTHAL: 14 Q. If I give you a -- if I represent the 15 definition taken from adrole.com is that 16 retargeting is a digital marketing tactic that 17 allows brands served ads tailored potential 18 customers based on the user's prior engagement 19 with the brand; for example, it's often used to 20 target shoppers who have visited a website but 21 left without making a purchase aiming to 22 re-engage the sale. 23 Does that sound like a reasonable 24 definition? 25 A. I accept that definition.</p>

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<p style="text-align: right;">Page 206</p> <p>1 Q. We've all seen this kind of advertising 2 on the Web where you are on a site, you look at 3 some shoes, you don't check out, and all of a 4 sudden, all you see is that pair of shoes? 5 MR. HILLEGAS: Object to form. 6 THE WITNESS: I am familiar with, 7 you know, trying to follow around people on the 8 Web. 9 BY MR. STEINTHAL: 10 Q. So in this hypothetical, rather than 11 introducing new advertisers into my example as 12 Coke and Pepsi, I'm going to instead ask you to 13 assume that Coke has decided to accommodate 14 people like me who like their diet Coke with a 15 home delivery, have a ready stash of diet Coke 16 at home. Let's assume that it's profitable for 17 Coke to have that so it's wants people to sign 18 up for the service, and the user has been on 19 Coke's website put the subscription into their 20 cart and hasn't checked out. So Coke puts the 21 user's cookie identifier on a remarketing list 22 to try to serve ads to them coming back and say 23 come back, please, you want your Coke 24 subscription, right. 25 But in the hypothetical, Coke does that</p>	<p style="text-align: right;">Page 208</p> <p>1 advantage buying tool A over B with respect to 2 the advertiser, so -- so that seems like a -- 3 seems like rather different. 4 Q. So when the ad comes up with the auction 5 and the user uses the website and the Coke 6 identifier comes out in the BidRequest, so in 7 my -- same as all the prior examples, now the ad 8 exchange sends the request to A and B saying 9 that the user identifiers is 1, 2,3; A knows 10 that 1, 2, 3 is on Coke's remarketing list, and 11 so Coke is willing to pay just say \$2 for seeing 12 that ad; B does not know that 1, 2, 3 is 13 (inaudible) that Coke is trying to retarget it; 14 and so B says -- B understands that Coke or 15 Pepsi is each willing to bid only \$.50 for an 16 average user. 17 My question is: Does A have an 18 information advantage over B in that scenario? 19 MR. HILLEGAS: Objection; form. 20 THE WITNESS: I can say objectively 21 buying tool A has more information about 22 customers, about certain customers, than buying 23 tool B, because it knows there is a list of 24 customers who have, you know, information that 25 they have looked at Coke.</p>
<p style="text-align: right;">Page 207</p> <p>1 only on buying tool A. So basically it 2 configures sends buying tool A a list of cookie 3 identifiers they want to serve the ad for the 4 new subscription to and it doesn't sell it to B. 5 Given those facts, does it seem 6 reasonable to you believe that Coke would be 7 willing to pay more to show an ad to that user 8 who it wants to retarget than some average user? 9 MR. HILLEGAS: Objection; form. 10 THE WITNESS: The scenario you're 11 asking is whether Coke is willing to pay more 12 for this, which is an economic analysis, which I 13 think is outside of my area of expertise. 14 BY MR. STEINTHAL: 15 Q. Let's make that assumption -- 16 A. Okay. 17 Q. -- for the question. Knowing that, that 18 with that assumption, and knowing that only A 19 has the list of users who Google is going to pay 20 more for, would you say that A has information 21 advantage over B? 22 A. So when we're talking about information 23 advantage here, you're talking -- Coke is having 24 business potential with both buying to A and B, 25 and now we're talking about information</p>	<p style="text-align: right;">Page 209</p> <p>1 But I'm just trying to figure out 2 who are we talking about who is having an 3 advantage, because now we're talking about 4 whether the tool has an advantage rather than 5 the advertiser, and I'm -- and does buying tool 6 A -- buying tool A has more information than 7 buying tool B. The information seems to be 8 relevant to Coke specifically. So in that 9 context, if everything else was equal, it would 10 seem to be, you know, that A would have an 11 advantage. But it's -- I'm getting a little 12 lost now on who we're talking about having 13 advantages. 14 BY MR. STEINTHAL: 15 Q. I think in all of the prior examples 16 we've been talking about principally whether A 17 has an advantage over B and vice versa in 18 (inaudible) buying tools, and I think what this 19 example is designed to illustrate is that here A 20 has more information than B. It's, in fact, 21 likely to be material. It's going to -- it will 22 cause it to bid twice as much and, therefore, 23 likely win the auction. But in this case the 24 information came from the advertiser and not the 25 exchange.</p>

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<p style="text-align: right;">Page 210</p> <p>1 And my question is: Is that still 2 information imbalance in the form you're 3 describing in your report? 4 A. So the notion is that it's coming from 5 the advertiser but it's going directly to tool A 6 and bypassing the exchange? 7 Q. Correct. 8 A. So in that scenario, we're talking 9 about -- we're now talking about the whole world 10 as opposed to the information advantage that -- 11 the ad exchange itself isn't creating an 12 advantage, but buying tool A does have an 13 information advantage because it just has more 14 relevant information. 15 Q. So to your earlier -- that caveat that 16 you drew earlier, you were saying that A has an 17 absolute advantage over B, but it's not caused 18 by the exchange? 19 A. Yes. 20 Q. You would say it's caused by Coke in that 21 example, correct? 22 A. I guess the Dallas -- 23 Q. In this case Coke? 24 A. Coke, right. Yes. 25 Q. Okay.</p>	<p style="text-align: right;">Page 212</p> <p>1 Does A have an information advantage over 2 B? 3 MR. HILLEGAS: Objection; form. 4 THE WITNESS: In the scenario as I 5 understand it, all parties have exactly the same 6 information, both A and B, with the only 7 difference being that A has information that the 8 user that is viewing the page, which is 9 requesting the ad, is not interested in soda. 10 That information is relevant, 11 clearly, for Coke versus Pepsi and B doesn't 12 have access to it, so that is information 13 advantage. 14 Now, in terms of -- I'll stop there. 15 BY MR. STEINTHAL: 16 Q. Okay. And it's advantage for A over B in 17 this case, not necessarily Coke over Pepsi, 18 correct? 19 MR. HILLEGAS: Objection; form. 20 THE WITNESS: In this context, A 21 knows that the user is less valuable to soda 22 advertisers versus B. 23 BY MR. STEINTHAL: 24 Q. And if I assume that Coke uses tool A and 25 Pepsi uses tool B, would it still be the case</p>
<p style="text-align: right;">Page 211</p> <p>1 MR. HILLEGAS: It's about an hour. 2 THE WITNESS: How are we doing 3 time-wise? 4 MR. HILLEGAS: If it's short... 5 MR. HUNSBERGER: We can go off the 6 record. 7 THE VIDEOGRAPHER: We're going off 8 the record at 3:24 p.m. 9 (Off-the-record discussion was held.) 10 THE VIDEOGRAPHER: We're going back 11 on the record at 3:44 p.m. 12 BY MR. STEINTHAL: 13 Q. Professor, I have one more question on 14 this chart. You have the chart in front of you. 15 So in this example we're going to again assume 16 that the exchange ads with identifier A and B, 17 and A and B have the same information about the 18 user. They can infer the same demographics. 19 They have the same sort of inferences that 20 they've drawn. The only difference in this 21 example is that A has determined that the user 22 is a health food advocate who would never want 23 to buy soda, and B doesn't know that. B still 24 knows it's a 25-year-old man whatever but it 25 that it doesn't want to buy soda.</p>	<p style="text-align: right;">Page 213</p> <p>1 that Coke and Pepsi are information balance or 2 would that be -- would that change the scenario? 3 MR. HILLEGAS: Objection; form. 4 THE WITNESS: So here, like the 5 earlier scenarios, what we're talking about is 6 one party having a bit more information that is 7 relevant to the decision versus other parties, 8 and so as an information advantage is if you 9 have a more -- if -- it's not about more. It's 10 about the right information for making a better 11 decision versus the other one, and this is what 12 we're talking about in my report in the 13 difference between the two, the internal versus 14 the external bidders. 15 BY MR. STEINTHAL: 16 Q. Okay. And now I'm going to sum up the 17 stream of hypotheticals that we just looked at. 18 Is it fair to say information imbalances can 19 arise because of the information that's provided 20 by the exchange to two different buying tools 21 about a given auction that can cause an 22 imbalance? 23 Yeah, sorry, I missed a word. Let me try 24 to rephrase my question again. 25 Is it fair to say that information</p>

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<p style="text-align: right;">Page 214</p> <p>1 imbalance can arise because of difference in the 2 information that is shared by an exchange with 3 two different participants in the auction? 4 A. Yes. 5 Q. And is it fair to say that an information 6 imbalance can arise because persons in the 7 auction have different amounts of their own 8 proprietary information that they're able to 9 access about the auction? 10 A. The information imbalance can arise if 11 certain parties have access to more relevant 12 proprietary information. 13 Q. And the same can be true about a 14 difference between information that an 15 advertiser has about the auction such as the fact 16 that Coke thinks that it wants to advertise this 17 user more than Pepsi because of the 18 remarketing-type thing? 19 A. If one -- if one bidder has information 20 that can be used to determine that a given user 21 is more valuable to that advertiser than to 22 another, that is information that is relevant. 23 In terms of the advantage, again, we're 24 getting into much more complex scenarios with 25 many more parties, so...</p>	<p style="text-align: right;">Page 216</p> <p>1 can determine a value, they can get an accurate 2 model of what it is they're, you know, bidding 3 on; and that's where having the right 4 information and having information disadvantage 5 matters. 6 BY MR. STEINTHAL: 7 Q. And sometimes it might even cause an 8 advertiser not to bid at all or cause a bidder 9 not to bid at all? 10 MR. HILLEGAS: Objection; form. 11 THE WITNESS: It can cause arbitrary 12 changes in bidding behavior. 13 BY MR. STEINTHAL: 14 Q. And determining what those arbitrary 15 changes are is a complicated question that's 16 outside of your relevant opinions in this case, 17 correct? 18 A. Yes. 19 Q. Okay. You can thankfully put that aside. 20 I don't have any more questions about Coke and 21 Pepsi? 22 MR. HILLEGAS: Does that mean you're 23 out of diet Coke questions? 24 MR. STEINTHAL: When it runs out, I 25 get more.</p>
<p style="text-align: right;">Page 215</p> <p>1 Q. And as you just said, the advantage can 2 be something that causes the buying tool to want 3 to bid more for an impression, in some cases 4 like the remarketing example? 5 MR. HILLEGAS: Objection; form. 6 THE WITNESS: An information 7 advantage allows a bidder to, you know, bid more 8 accurately -- well, sorry. 9 An information advantage -- in my 10 report, I offer a discussion of the information 11 advantage in Google's ad auction. 12 I'm not talking about the 13 consequences of those information advantages. 14 BY MR. STEINTHAL: 15 Q. Okay. But sometimes information 16 advantage would lead a bidder to bid more than 17 if it didn't have the additional information, 18 correct? 19 MR. HILLEGAS: Objection; form. 20 THE WITNESS: An information 21 advantage could cause higher or lower bids. 22 That's relevance of economics how -- what 23 exactly what to bid. But what it allows them to 24 do is to make more accurate assessments of value 25 of it. And so how well you -- how well a party</p>	<p style="text-align: right;">Page 217</p> <p>1 BY MR. STEINTHAL: 2 Q. Perhaps we've been discussing one of your 3 conclusions in your report is that Google has an 4 advantage over other parties' ads in Google; is 5 that correct? 6 MR. HILLEGAS: Objection; form. 7 THE WITNESS: My opinion is that 8 Google does have information advantage overall 9 of their participants in its advertising 10 platform. 11 BY MR. STEINTHAL: 12 Q. And beyond the fact that information 13 advantage exists, do you have an opinion as to 14 whether that advantage allowed Google buying 15 tools to win more auctions for its customers 16 than Google's rivals? 17 MR. HILLEGAS: Objection; form. 18 THE WITNESS: I do not offer an 19 opinion on the number of auctions that Google 20 would or would not win. 21 BY MR. STEINTHAL: 22 Q. Apart from the quantification question of 23 exactly how many, do you offer the opinion that 24 it would allow, in general, it would allow 25 Google's buying tools to win more auctions?</p>

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<p style="text-align: right;">Page 218</p> <p>1 A. In my understanding of Google's auction 2 system, every auction that is won is a cost, 3 because when they win an auction, Google has to 4 payout. Google only gets paid unless we're 5 talking about cost per mille, but if we're 6 talking about cost per click, they are only paid 7 when a user clicks on an ad. So winning more 8 auctions is not the key thing. It's winning the 9 right auctions that lead to clicks for which 10 they get pays. 11 Q. But you testified earlier your opinions 12 don't extend to the consequences of the 13 information advantage other than in the limited 14 context of your response to Professor Milgrom's 15 comment? 16 MR. HILLEGAS: Objection; form. Not 17 quite you finished that sentence there, Counsel. 18 It kind of faded off there, so... 19 BY MR. STEINTHAL: 20 Q. Let me try that again. 21 Are there any consequences of Google's 22 information advantage that you are willing to 23 testify to in this case? 24 A. I'm willing to testify that that 25 information advantage inhibits the ability of</p>	<p style="text-align: right;">Page 220</p> <p>1 should win and then to decide how to win them 2 for whatever price they want because they know 3 the value of it -- 4 BY MR. STEINTHAL: 5 Q. But -- 6 A. -- relative to others. 7 Q. But for whatever set of auctions that 8 Google thinks are the right auctions to win, you 9 have not offered an opinion that it's one or 10 more of those, correct? 11 MR. HILLEGAS: Objection; form. 12 THE WITNESS: I do not offer an 13 opinion on which precise auctions Google has won 14 or has not won. 15 BY MR. STEINTHAL: 16 Q. Or any impact that the Google information 17 advantage has on the auction, it's likely to win 18 auctions, correct? 19 MR. HILLEGAS: Objection; form. 20 THE WITNESS: My opinion details 21 with the information at a high level that goes 22 into the decisions to make bids what to 23 calculate the bids in terms of the cost per 24 click to cost per mille, and implicitly part of 25 that is a at least probabilistic determination</p>
<p style="text-align: right;">Page 219</p> <p>1 other participants to understand the operations 2 inside of Google, whether they do experiments or 3 not, because that information differential makes 4 the internal system so opaque, that without 5 direct access to its internals to be 6 fundamentally difficult for anyone outside, I 7 will say certainly existing tools can bound the 8 behavior and make certain decisions, but 9 overall, they can't know what Google is doing to 10 a significant degree of accuracy. 11 Q. But you have not offered the opinion that 12 that information advantage leads to more auction 13 wins for Google buying tools and fewer auction 14 wins for non-Google buying tool, correct? 15 MR. HILLEGAS: Objection; form. 16 THE WITNESS: I do not offer an 17 opinion on whether it would lead to more or less 18 wins in the auctions. But from my understanding 19 of the functioning of the system, it's not even 20 in Google's best interest to do more or less. 21 It's to do the right ones, and the information 22 that they have means they understand the value 23 of these to a greater degree than outsiders and 24 thus they can win the auctions -- they have a 25 better ability to choose the auctions they</p>	<p style="text-align: right;">Page 221</p> <p>1 of which ones are going to be won and which ones 2 are not going to win. So that information 3 advantage directly feeds into the operation of 4 the auction. 5 I do not offer an opinion beyond -- 6 about the exact economic consequences of the 7 operation of the auction, but it's clearly 8 influencing behavior because it's part of the 9 predicted models that calculate price. 10 BY MR. STEINTHAL: 11 Q. Do you offer any opinion that Google's 12 information advantage caused advertisers using 13 Google's tools to receive better or worse return 14 on the ad spend? 15 MR. HILLEGAS: Object to form. 16 THE WITNESS: In my report, I do not 17 offer an opinion on the precise economic 18 consequences of the information advantage that 19 Google has. 20 BY MR. STEINTHAL: 21 Q. And you offered your opinion in your 22 report as to whether Google's information 23 advantage or non-Google buying tools converse 24 disadvantage cause that user that are using 25 non-Google tools to have a worse return ad</p>

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<p style="text-align: right;">Page 222</p> <p>1 spend?</p> <p>2 MR. HILLEGAS: Objection to form.</p> <p>3 THE WITNESS: Again, in my report I</p> <p>4 do not discuss the economic consequences of the</p> <p>5 information advantage or disadvantages.</p> <p>6 BY MR. STEINTHAL:</p> <p>7 Q. And if we look at publishers, I will ask</p> <p>8 the same question. Have you offered any opinion</p> <p>9 that Google's information advantage allows</p> <p>10 Google's publisher facing tools to earn more</p> <p>11 revenue than publisher customers than they would</p> <p>12 earn from non-Google tools?</p> <p>13 MR. HILLEGAS: Objection; form.</p> <p>14 THE WITNESS: I do not offer an</p> <p>15 opinion regarding the publishers in the -- I</p> <p>16 don't not offer an economic opinion regarding</p> <p>17 the publishers in Google's ecosystem.</p> <p>18 BY MR. STEINTHAL:</p> <p>19 Q. And have you offered any opinions that</p> <p>20 Google's information advantage allowed Google to</p> <p>21 charge more for its Adtech tools than otherwise</p> <p>22 could?</p> <p>23 MR. HILLEGAS: Objection; form.</p> <p>24 THE WITNESS: I do not offer an</p> <p>25 opinion on what the economic consequences are</p>	<p style="text-align: right;">Page 224</p> <p>1 code and documents indicates that Google</p> <p>2 maintains an information advantage over all</p> <p>3 other parties participating in the Google ad</p> <p>4 ecosystem, whether they be advertisers,</p> <p>5 publishers, or third-party ad exchanges."</p> <p>6 Do you see that?</p> <p>7 A. Yes.</p> <p>8 MR. HILLEGAS: Object to form.</p> <p>9 BY MR. STEINTHAL:</p> <p>10 Q. When you refer to, quote, "Google</p> <p>11 maintains an information advantage" in that</p> <p>12 paragraph, are you referring to the company as a</p> <p>13 whole or specific Google to products?</p> <p>14 A. I'm referring to the advantage that I</p> <p>15 observed in the source code that I reviewed.</p> <p>16 Q. And that information that you observed,</p> <p>17 is it information that is maintained by any</p> <p>18 specific Google tools?</p> <p>19 A. The systems that I refer to -- again, the</p> <p>20 focus of my analysis is, you know, the</p> <p>21 components on page 11, in figure one. So this</p> <p>22 portion of the Google infrastructure [REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>
<p style="text-align: right;">Page 223</p> <p>1 regarding prices for Google's information</p> <p>2 advantage.</p> <p>3 BY MR. STEINTHAL:</p> <p>4 Q. Have you offered any opinions that</p> <p>5 Google's information advantage allowed Google to</p> <p>6 earn more revenue than it otherwise would have</p> <p>7 earned?</p> <p>8 MR. HILLEGAS: Same objection.</p> <p>9 THE WITNESS: I do not offer any</p> <p>10 opinion on Google's revenues related to</p> <p>11 information advantage.</p> <p>12 BY MR. STEINTHAL:</p> <p>13 Q. So, Professor, is it correct, you are not</p> <p>14 opining on any economic impacts or affects of</p> <p>15 Google's purported information advantage?</p> <p>16 MR. HILLEGAS: Objection; form.</p> <p>17 THE WITNESS: My report discusses</p> <p>18 information advantage and its relationship to</p> <p>19 experiments participants in the market might</p> <p>20 perform to improve their importance. Beyond</p> <p>21 that, I do not discuss the effect on the</p> <p>22 economic actors.</p> <p>23 BY MR. STEINTHAL:</p> <p>24 Q. Turning to paragraph 14 of your report,</p> <p>25 you say, quote, My review of Google's source</p>	<p style="text-align: right;">Page 225</p> <p>1 [REDACTED]</p> <p>[REDACTED]</p> <p>4 Q. The analysis you can describe in your</p> <p>5 report, however, is -- compares the information</p> <p>6 available to Google's ad buying tools or non-ad</p> <p>7 buying tools, correct?</p> <p>8 MR. HILLEGAS: Object to form.</p> <p>9 THE WITNESS: In my analysis, I'm</p> <p>10 focused on the entities I can observe in the</p> <p>11 source code, and [REDACTED]</p> <p>[REDACTED]</p> <p>14 The tools that publishers and</p> <p>15 advertisers use are quite far from this, and the</p> <p>16 affects of them on this would be to put data</p> <p>17 into databases. So I analyzed this portion but</p> <p>18 not the tools per se, except for the influence</p> <p>19 of the behavior of these components.</p> <p>20 BY MR. STEINTHAL:</p> <p>21 Q. Professor, looking at page nine, heading</p> <p>22 4 in bold print, it says, "Google ad buying</p> <p>23 tools have access to more granular targeting</p> <p>24 information than do third-party buyers."</p> <p>25 Do you see that on page nine of your</p>

57 (Pages 222 - 225)

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<p style="text-align: right;">Page 226</p> <p>1 report?</p> <p>2 A. Sorry, page nine?</p> <p>3 Q. Paragraph four.</p> <p>4 A. Okay. Which paragraph again?</p> <p>5 Q. Heading in section four, bold print?</p> <p>6 A. Oh the heading?</p> <p>7 Q. Do you see that?</p> <p>8 A. Yes.</p> <p>9 Q. So I'll ask the question again. Is the</p> <p>10 analysis in your report is focused on the</p> <p>11 advantages that Google's ad buying tools had</p> <p>12 over third-party buying tools, correct?</p> <p>13 MR. HILLEGAS: Objection; form.</p> <p>14 THE WITNESS: So the title of this</p> <p>15 section, which refers to ad buying tools, is</p> <p>16 actually referring in the body to specific</p> <p>17 components, such as in paragraph 26, [REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>	<p style="text-align: right;">Page 228</p> <p>1 [REDACTED]</p> <p>2 [REDACTED]</p> <p>3 BY MR. STEINTHAL:</p> <p>4 Q. Google ads is an example of a Google</p> <p>5 buying tool, correct?</p> <p>6 A. I want to refer to Dr. Hochstetler's</p> <p>7 report.</p> <p>8 MR. STEINTHAL: We'll get a copy of</p> <p>9 it. You can look at it while we're marking it.</p> <p>10 We'll mark this as Somayaji Exhibit 4.</p> <p>11 (Exhibit Number 4 was marked.)</p> <p>12 MR. HILLEGAS: Is this a full set of</p> <p>13 all the defendants' source code appendix?</p> <p>14 MR. STEINTHAL: I don't think it is</p> <p>15 not the source code appendix.</p> <p>16 MR. HILLEGAS: I see appendix A, B,</p> <p>17 and not C just to confirm.</p> <p>18 MR. STEINTHAL: For the record, this</p> <p>19 is Dr. Hochstetler's report dated June 7, 2024,</p> <p>20 excluding appendix C, which is marked "Highly</p> <p>21 Confidential Source Code."</p> <p>22 THE WITNESS: So --</p> <p>23 BY MR. STEINTHAL:</p> <p>24 Q. My question was: Google ads is an</p> <p>25 example of Google's buying tools, correct?</p>
<p style="text-align: right;">Page 227</p> <p>1 [REDACTED]</p> <p>2 [REDACTED]</p> <p>3 [REDACTED]</p> <p>4 BY MR. STEINTHAL:</p> <p>5 Q. So despite the fact that your report</p> <p>6 reflects multiple times, even in just paragraph</p> <p>7 24, multiple times you refer to a comparison</p> <p>8 between Google's ad buying tools, the</p> <p>9 third-party buyers or third-party buying tools.</p> <p>10 Your position is that your analysis is</p> <p>11 actually only limited to the [REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>14 MR. HILLEGAS: Objection to form.</p> <p>15 THE WITNESS: [REDACTED]</p> <p>16 [REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>	<p style="text-align: right;">Page 229</p> <p>1 A. The reason why I was hesitant for naming</p> <p>2 that, because I'm looking at paragraph 13 from</p> <p>3 Dr. Hochstetler's report and just talking about</p> <p>4 the complexity of the terminology, and I'm</p> <p>5 referring to paragraph 12 and paragraph 13,</p> <p>6 so...</p> <p>7 [REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>24 Q. Okay. There are many references in your</p> <p>25 report to Google buying tools. Do you have any</p>

Page 232

1 [REDACTED]
[REDACTED]
3 A. [REDACTED]
[REDACTED]
[REDACTED]
6 Q. [REDACTED]
[REDACTED]
8 MR. HILLEGAS: Objection; form.
9 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
13 BY MR. STEINTHAL:
14 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
18 MR. HILLEGAS: Objection; form.
19 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Page 233

1 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
5 BY MR. STEINTHAL:
6 Q. [REDACTED]
[REDACTED]
[REDACTED]
9 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
14 MR. HILLEGAS: Objection; form.
15 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
20 BY MR. STEINTHAL:
21 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
25 MR. HILLEGAS: Objection; form.

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1 THE WITNESS: [REDACTED]
[REDACTED]
4 BY MR. STEINTHAL:
5 Q. Are there any other addition aspects of
6 information advantage that you identify in your
7 report?
8 MR. HILLEGAS: Objection; form.
9 THE WITNESS: Those are the two
10 aspects of the information advantage. I cannot
11 say that that was the only advantages, but those
12 are the ones that I described.
13 BY MR. STEINTHAL:
14 Q. In your report?
15 A. In my report.
16 Q. Do you offer any opinions in your report
17 -- well, strike that.
18 Do you offer any opinions in your report
19 as to any information advantages that Google ad
20 managed or Google AdX possess over any other
21 participants?
22 MR. HILLEGAS: Objection; form.
23 THE WITNESS: [REDACTED]
[REDACTED]

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1 BY MR. STEINTHAL:
2 Q. [REDACTED]
3 A. [REDACTED]
[REDACTED]
5 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
10 A. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
16 Q. Let's turn back to paragraph 14 of your
17 report where you write that, quote, This
18 information imbalance between Google and
19 non-Google participants impacts which ads are
20 displayed, where they are shown, and the price
21 that is paid for them."
22 How does such information and imbalance
23 impact which ads are displayed?
24 MR. HILLEGAS: Objection; form.
25 BY MR. STEINTHAL:

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1 Q. How does the information imbalance that
2 you described in your report describe how ads
3 are displayed?
4 A. What I show is that there is more
5 specific information available to the choosing
6 of ads, and there's a great deal of information
7 in model for choosing those ads. So your
8 question is -- the specific impact on which ads
9 are chosen, that is outside the scope of my
10 analysis, because again, I'm looking at source
11 code.
12 Q. So your opinion was that it has some
13 impact but you did not analyze what that impact
14 was?
15 MR. HILLEGAS: Objection; form.
16 THE WITNESS: My opinion is that
17 there's information advantage to [REDACTED]
[REDACTED]. I do not offer opinion in how that
19 information advantage manifests into specific
20 economic consequences beyond, you know, the
21 challenge of being able to predict outcomes --
22 third-parties being able to predict outcomes
23 through experiments.
24 BY MR. STEINTHAL:
25 Q. You say information imbalance that you

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1 describe in your report impacts where "they"
2 meaning "ads" are shown. Did you analysis the
3 nature of that impact?
4 MR. HILLEGAS: Objection; form.
5 THE WITNESS: When I say impact
6 here, I'm talking about in an algorithmic sense,
7 that those are inputs to it, that those
8 decisions are changed because of those inputs;
9 and while in principle, it's possible all
10 additional information models would lead to the
11 system putting the same decisions as it would
12 without those, creating such a system would be
13 an exercise of wasted resources.
14 BY MR. STEINTHAL:
15 Q. So your opinion is simply that the
16 information Google has, [REDACTED]
[REDACTED]; is that the nature of
19 your opinion?
20 MR. HILLEGAS: Objection; form.
21 THE WITNESS: My opinion is that
22 Google has information about publishers,
23 advertisers, users. [REDACTED]
[REDACTED]

[illegible]

7 BY MR. STEINTHAL:

8 Q. Okay. But your opinion does not extend
9 to quantifying or describing that impact other
10 than it would have some effect?

11 MR. HILLEGAS: Objection to form.

12 THE WITNESS: I do not offer an
13 opinion on the quantification of that impact.

14 BY MR. STEINTHAL:

15 Q. Turn to paragraph 20 of your report. I'm
16 sorry, that's the wrong number. Try 23.

17 In paragraph 23 about five lines to the
18 bottom sentence that begins "However," do you
19 see that?

20 A. Yes.

21 Q. The sentence says, "However, If it can be
22 shown that different parties have access to
23 different information, and if that information
24 can impact on how auctions are conducted, it
25 would instead be my opinion that there is an

1 There's two conditionals in that
2 sentence. I'm asking if you have, in fact, in
3 this case shown condition one, different parties
4 asked different information, and condition two
5 that is the information can impact on how
6 auctions are conducted?

7 MR. HILLEGAS: Objection to form.

8 THE WITNESS: So the first part of
9 that sentence different parties have access to
10 different information. My opinion is that is
11 shown by [REDACTED]

[REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]

[illegible]

1 information imbalance that favors certain
2 parties over others. Such is the case here."

3 Is that a correct statement of your
4 opinion in your report?

5 MR. HILLEGAS: Objection; form.

6 THE WITNESS: That is my opinion in
7 my report. That is what is said in my report.

8 BY MR. STEINTHAL:

9 Q. Have you, in fact, in your report shown
10 that the different parties have asked for
11 different information and that information can
12 impact on how auctions are conducted?

13 MR. HILLEGAS: Objection; form.

14 THE WITNESS: Could you repeat the
15 question?

16 BY MR. STEINTHAL:

17 Q. Sure. Rephrase slightly. Paragraph 23
18 states, a conditional, as I read it. You say,
19 "However, If it can be shown that different
20 parties have access to different information,
21 and if that information can impact on how
22 auctions are conducted, it would instead be my
23 opinion that there is an information imbalance
24 that favors certain parties over others. Such
25 is the case here."

1 [REDACTED]
[REDACTED]
[REDACTED]
4 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

12 BY MR. STEINTHAL:

13 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

17 MR. HILLEGAS: Objection to form.

18 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

23 BY MR. STEINTHAL:

24 Q. [REDACTED]
[REDACTED]

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1 [REDACTED]
2 A. [REDACTED]
3 Q. [REDACTED]
4 MR. HILLEGAS: Objection; form.
5 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
15 BY MR. STEINTHAL:
16 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
20 MR. HILLEGAS: Objection; form.
21 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

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1 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
9 BY MR. STEINTHAL:
10 Q. [REDACTED]
[REDACTED]
[REDACTED]
13 MR. HILLEGAS: Objection; form.
14 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
25 BY MR. STEINTHAL:

Page 244

1 Q. [REDACTED]
[REDACTED]
3 A. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
7 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
11 MR. HILLEGAS: Objection; form.
12 THE WITNESS: [REDACTED]
[REDACTED]
14 BY MR. STEINTHAL:
15 Q. [REDACTED]
[REDACTED]
[REDACTED]
18 MR. HILLEGAS: Objection to form.
19 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

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1 [REDACTED]
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14 [REDACTED]
[REDACTED]
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[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
21 BY MR. STEINTHAL:
22 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

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<p>Page 250</p> <p>1 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]</p> <p>9 BY MR. STEINTHAL:</p> <p>10 Q. So I was -- okay. Finish.</p> <p>11 A. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]</p> <p>17 Q. Try my last question again.</p> <p>18 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]</p> <p>24 MR. HILLEGAS: Objection to form.</p> <p>25 THE WITNESS: [REDACTED]</p> <p>Page 251</p> <p>1 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]</p> <p>9 BY MR. STEINTHAL:</p> <p>10 Q. [REDACTED] [REDACTED] [REDACTED]</p> <p>13 A. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]</p> <p>20 Q. Did you conduct any interviews with</p> <p>21 advertisers or do any other research or analysis</p> <p>22 to assess whether advertisers are seeking to</p> <p>23 understand the internal operation of Google</p> <p>24 systems?</p> <p>25 A. I did not conduct any interviews as part</p>	<p>Page 252</p> <p>1 of my work here.</p> <p>2 Q. Are you aware of any evidence in this</p> <p>3 case supporting the conclusion that advertisers</p> <p>4 are interested in the internal operations of</p> <p>5 Google's systems?</p> <p>6 MR. HILLEGAS: Objection to the</p> <p>7 form.</p> <p>8 THE WITNESS: I see from</p> <p>9 Dr. Milgrom's report his response to the other</p> <p>10 experts that they are asserting that</p> <p>11 third-parties are at a disadvantage, and I</p> <p>12 referred to that.</p> <p>13 BY MR. STEINTHAL:</p> <p>14 Q. Other than paragraph 32 that we discussed</p> <p>15 earlier, are you aware of any evidence or record</p> <p>16 in this case suggesting that advertisers are</p> <p>17 interested in understanding the internal</p> <p>18 operation of Google's models?</p> <p>19 A. I am not aware but I have not looked for</p> <p>20 such evidence.</p> <p>21 Q. So again, referring -- I think we're kind</p> <p>22 of at an hour but I'm going to try to wrap this</p> <p>23 up.</p> <p>24 Referring you back to paragraph 13 of</p> <p>25 your report, you say that your rebuttal report</p> <p>Page 253</p> <p>1 responds to Dr. Milgrom's claims that publishers</p> <p>2 and advertisers are able to optimize their</p> <p>3 behavior and the response that Google introduces</p> <p>4 with add-on programs.</p> <p>5 If you just testified the information</p> <p>6 advantage that you are discussing relates to</p> <p>7 advertisers and not publishers, why is</p> <p>8 publishers mentioned in paragraph 13?</p> <p>9 MR. HILLEGAS: Objection; form.</p> <p>10 THE WITNESS: Previously I was</p> <p>11 talking about the page inventory that's offered</p> <p>12 in the system is coming from the website that</p> <p>13 Google has a relationship, those are the ones</p> <p>14 that it's serving ads to. That's how the</p> <p>15 system's setup. When I talk about publishers,</p> <p>16 advertiser, optimize, this is talking about</p> <p>17 those publishers that are being able to --</p> <p>18 because they set rules and other things to say</p> <p>19 how should I make sure I maximize my revenue</p> <p>20 that I get from Google. How should I setup my</p> <p>21 system so that I can receive the -- you know, ad</p> <p>22 inventory, that's publishers conduct experiments</p> <p>23 to maximize their revenue from Google. That, in</p> <p>24 parts, requires them understanding what Google</p> <p>25 wants them to do, and that system is opaque, and</p>
--	---

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1 that system, in part, has to be opaque, because
2 some scammers try to, you know, manipulate it,
3 but it's also used for the positive
4 participants.

5 BY MR. STEINTHAL:

6 Q. So again, referring to the information
7 advantage we've been discussing between [REDACTED]
8 [REDACTED], is it your opinion
9 that information advantage effects advertisers'
10 ability to optimize their behavior and respond
11 to the changes that Google introduces to add-on
12 programs?

13 A. So the information advantage I'm really
14 talking about is talking about Google over
15 everyone else, and so to understand, we have to
16 think about each of the participants. We have
17 to know the publishers that are putting their
18 ads up. We have to think of the first-party
19 advertisers, and then we have to think of the
20 third-party advertisers. I'm saying all of
21 those participants are at an information
22 disadvantage to Google who's sitting in the
23 middle running these systems and using access to
24 lots of information that none of the other
25 parties have access to.

Page 255

1 Q. If we were to substitute Google with some
2 other ad exchange, would that not be the same?
3 Would the exchange not always have more
4 information than any addition publisher or
5 advertiser?
6 A. A classic ad exchange would, you know --
7 the old style would do things in cost per mille,
8 and so the advertisers would come in with a
9 price and then it would just be -- the ad
10 exchange would just compare them and decides who
11 wins and then sends it out; and then presumably,
12 it would send out the request using the same
13 data structure to all participants for them to
14 decide what they do. This is much like the
15 analogy like you said.

16 What we have with Google is a very
17 different system in which the internal system is
18 doing a lot more work than just comparing cost
19 per mille things, and that's the heart of the
20 information disadvantage all participants are
21 under except for Google.

22 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Page 256

1 [REDACTED]
2 MR. HILLEGAS: Objection; form.
3 THE WITNESS: [REDACTED]

[illegible][illegible]

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7 BY MR. STEINTHAL:
8 Q. I have one last question before you take
9 a break. You have not analyzed, have you, of
10 the relative benefits to advertisers of using
11 Google's -- the development advantage per costs
12 of using Google's ad buying tools versus other
13 ad buying tools, have you?
14 MR. HILLEGAS: Objection to form.
15 THE WITNESS: My analysis in my
16 report is about the source code. I do not have
17 an analysis of other ad buying systems.
18 BY MR. STEINTHAL:
19 Q. Or the cost or benefits of advertisers
20 using Google's tools versus not using Google's
21 tools?
22 MR. HILLEGAS: Objection to form.
23 THE WITNESS: I wouldn't be doing an
24 economic analysis of such systems. I have not
25 looked at the source code of such systems.

Page 260

1 [REDACTED]
[REDACTED]
3 A. [REDACTED]
[REDACTED]
[REDACTED]
6 Q. [REDACTED]
[REDACTED]
8 A. [REDACTED]
9 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
13 MR. HILLEGAS: Objection; form.
14 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
22 BY MR. STEINTHAL:
23 Q. [REDACTED]
24 A. [REDACTED]
[REDACTED]

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[illegible]

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Page 262

1 [REDACTED]
[REDACTED]
3 MR. HILLEGAS: Objection; form.
4 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
13 BY MR. STEINTHAL:
14 Q. I'll ask the question again. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
20 MR. HILLEGAS: Objection; form.
21 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]

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1 [REDACTED]
[REDACTED]
[REDACTED]
4 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
11 BY MR. STEINTHAL:
12 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
16 MR. HILLEGAS: Objection; form.
17 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Page 264

1 [REDACTED]
[REDACTED]
[REDACTED]
4 BY MR. STEINTHAL:
5 Q. [REDACTED]
[REDACTED]
[REDACTED]
9 A. [REDACTED]
10 Q. [REDACTED]
[REDACTED]
12 A. [REDACTED]
13 Q. [REDACTED]
[REDACTED]
15 MR. HILLEGAS: Objection; form.
16 THE WITNESS: [REDACTED]
17 BY MR. STEINTHAL:
18 Q. [REDACTED]
[REDACTED]
20 A. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Page 265

1 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
9 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
17 Q. [REDACTED]
[REDACTED]
[REDACTED]
20 MR. HILLEGAS objection; form.
21 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

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Page 266

1 [REDACTED]
[REDACTED]
3 BY MR. STEINTHAL:
4 Q. [REDACTED]
[REDACTED]
[REDACTED]
7 MR. HILLEGAS: Objection; form.
8 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
13 BY MR. STEINTHAL:
14 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
18 MR. HILLEGAS: Objection; form.
19 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
23 BY MR. STEINTHAL:
24 Q. [REDACTED]
[REDACTED]

Page 267

1 [REDACTED]
[REDACTED]
[REDACTED]
4 MR. HILLEGAS: Objection to form.
5 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
16 BY MR. STEINTHAL:
17 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
20 MR. HILLEGAS: Objection; form.
21 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Page 268

1 [REDACTED]
[REDACTED]
[REDACTED]
4 BY MR. STEINTHAL:
5 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
11 MR. HILLEGAS: Objection; form.
12 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
15 BY MR. STEINTHAL:
16 Q. Move on to something different. Did you
17 investigate the types or amounts of data that
18 third-party buying tools have available to them?
19 MR. HILLEGAS: Objection to form.
20 BY MR. STEINTHAL:
21 Q. And third-party buying tools somebody
22 other than Google?
23 A. I analyzed the data [REDACTED]
[REDACTED]
25 Q. So you analyzed the data by Google. Did

Page 269

1 you conduct any analysis of the total amounts of
2 information that is available to them from all
3 sources?
4 MR. HILLEGAS: Objection; form.
5 THE WITNESS: I did not conduct any
6 analysis outside the bounds of Google source
7 code and the associate documentation.
8 BY MR. STEINTHAL:
9 Q. So you have no opinion as to whether or
10 not non-Google buying tools have data that is
11 equivalent to the information that you allege is
12 being fed into Google's machine learning models,
13 did you?
14 MR. HILLEGAS: Objection; form.
15 THE WITNESS: In my report, I did
16 not offer an opinion in the information
17 available to third-party tools outside of the
18 data that is given to them [REDACTED].
19 BY MR. STEINTHAL:
20 Q. [REDACTED]
[REDACTED]
22 MR. HILLEGAS: Objection; form.
23 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]

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Page 270

1 BY MR. STEINTHAL:
2 Q. [REDACTED]
3 [REDACTED]
4 MR. HILLEGAS: Objection; form.
5 THE WITNESS: [REDACTED]
6 [REDACTED]
7 [REDACTED]
8 [REDACTED]
9 [REDACTED]
10 BY MR. STEINTHAL:
11 Q. If hypothetically Google provided less
12 information to third parties that they were able
13 to obtain the same information, the missing
14 information from other sources, would Google
15 still have information advantage?
16 MR. HILLEGAS: Objection; form.
17 THE WITNESS: Implicitly of your
18 questions are two questions. One is if the
19 third-parties had access to the same
20 information, could they make up for the
21 information disadvantage that they have, you
22 know, relative to Google. And the second
23 question, as I understand it, is that's
24 plausible, because it's plausible for
25 third-parties to have such information to get

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1 the same information that Google has. It's not
2 a simple matter of having a lot of information.
3 You have to have the right information, and you
4 have to have it -- you have to be able to
5 observe from the right perspective.
6 Google is [REDACTED]
7 [REDACTED]
8 [REDACTED]
9 Third-parties do not, in general, sit where
10 Google does in the Internet. Google has lots of
11 points of observation. Most parties don't have
12 anything close to that. With those, they can
13 get that information, in particular from a
14 particular ad service. let me be specific.
15 [REDACTED]
16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 [REDACTED]
20 [REDACTED]
21 [REDACTED]
22 [REDACTED]
23 [REDACTED]
24 [REDACTED]
25 [REDACTED]

Page 272

1 [REDACTED]
2 [REDACTED]
3 [REDACTED]
4 [REDACTED]
5 [REDACTED]
6 [REDACTED]
7 [REDACTED]
8 [REDACTED]
9 [REDACTED]
10 [REDACTED]
11 [REDACTED]
12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 [REDACTED]
20 [REDACTED]
21 [REDACTED]
22 BY MR. STEINTHAL:
23 Q. [REDACTED]
24 [REDACTED]
25 [REDACTED]

Page 273

1 [REDACTED]
2 [REDACTED]
3 MR. HILLEGAS: Objection; form.
4 THE WITNESS: [REDACTED]
5 [REDACTED]
6 [REDACTED]
7 BY MR. STEINTHAL:
8 Q. [REDACTED]
9 [REDACTED]
10 [REDACTED]
11 [REDACTED]
12 MR. HILLEGAS: Objection; form.
13 THE WITNESS: [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 [REDACTED]
20 BY MR. STEINTHAL:
21 Q. And you also did not offer an opinion as
22 to whether or not those third-parties could
23 obtain equivalent data from other sources other
24 than Google, correct?
25 MR. HILLEGAS: Objection; form.

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<p style="text-align: right;">Page 274</p> <p>1 THE WITNESS: I do not offer an 2 opinion on an ability of third parties to obtain 3 such information. 4 BY MR. STEINTHAL: 5 Q. Did you attempt to analyze that? 6 MR. HILLEGAS: Objection; form. 7 THE WITNESS: My -- I chose to 8 approach the assignment that was given was to 9 respond to the opinion of Dr. Milgrom that 10 advertisers and publishers are able to optimize 11 the behavior response modifications that Google 12 introduced to its auction programs. I took that 13 question and my interpretation was to look at 14 the information advantage in Google source code. 15 So that's what I analyzed here, and in my 16 opinion, the analysis of that source code is 17 sufficient to address that question. I'm not 18 saying there aren't other ways to address that 19 question. 20 BY MR. STEINTHAL: 21 Q. Okay. So staying on that opinion. You 22 offered opinions on the case, information 23 imbalance in the information that's provided by 24 Google's ad exchange to its only internal buyers 25 third parties ad buyers, have you -- is that</p>	<p style="text-align: right;">Page 276</p> <p>1 example. Do you recall that hypothetical? 2 A. Yes. 3 Q. Okay. And in that case, the conclusion 4 was that the exchange had not caused information 5 imbalance between A and B just because it held 6 on to the information itself either, correct? 7 MR. HILLEGAS: Objection; form. 8 THE WITNESS: In the context of that 9 hypothetical with only two ad buying tools in an 10 exchange, yes. 11 BY MR. STEINTHAL: 12 Q. Okay. So now in the real world, more 13 buyers and Google's ad exchange, my question is 14 if Google's ad exchange has information about ad 15 auctions, about impressions, whatever that is 16 about, that is more than information is 17 available to any particular buying tool bidding 18 into the exchange, my question is, is that the 19 information imbalance that you're describing in 20 your report? 21 MR. HILLEGAS: Objection; form. 22 THE WITNESS: As I said, the 23 information imbalance takes multiple forms. One 24 form of it is that third-parties do not get 25 access to the same information [REDACTED]</p>
<p style="text-align: right;">Page 275</p> <p>1 correct? 2 MR. HILLEGAS: Objection; form. 3 BY MR. STEINTHAL: 4 Q. I'll rephrase. 5 Professor, your opinion on information on 6 imbalance in this case focuses on different 7 information that is made available to Google's 8 ad buying tools by Google's ad exchange and the 9 information that is made available to 10 third-party buyers by Google's ad exchange; is 11 that correct? 12 A. I agree with that statement to the degree 13 it aligns with the [REDACTED] 14 [REDACTED] 15 Q. And I think we might have asked this 16 question earlier, it refers to that information 17 imbalance analysis, are you concerned with the 18 potential imbalance between Google's ad exchange 19 itself and any particular buyer? 20 A. My analysis is at a level of source code. 21 Not of that of any particular buyer. 22 Q. As I recall one of the earlier 23 hypotheticals we discussed involved an exchange 24 that new information about the user but did not 25 share it with either of the buying tools in that</p>	<p style="text-align: right;">Page 277</p> <p>1 [REDACTED]. 2 But Google as an ad exchange, does 3 much more than the ad exchange in the 4 hypothetical, because it is [REDACTED] 5 [REDACTED] 6 [REDACTED] 7 [REDACTED] 8 [REDACTED] 9 [REDACTED] 10 [REDACTED] 11 [REDACTED] 12 [REDACTED] 13 [REDACTED]. 14 BY MR. STEINTHAL: 15 Q. Are you offering an opinion in this case 16 as to the information advantage possessed or as 17 to -- strike that. 18 Are you offering an opinion in this case 19 as to an information advantage that's possessed 20 by Google's ad exchange over non-Google ad 21 buying tools? 22 MR. HILLEGAS: Objection; form. 23 THE WITNESS: I'm offering an 24 opinion regarding the information balance and 25 participants in Google's infrastructure [REDACTED]</p>

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1 [REDACTED] and the degree to which
2 those effect the various buying tools.
3 BY MR. STEINTHAL:
4 Q. [REDACTED]
[REDACTED]
[REDACTED]
7 MR. HILLEGAS: Objection; form.
8 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
14 BY MR. STEINTHAL:
15 Q. [REDACTED]
[REDACTED]
[REDACTED]
18 A. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Page 279

1 [REDACTED].
2 Q. [REDACTED]
[REDACTED]
4 [REDACTED]
[REDACTED]
6 A. [REDACTED]
7 Q. [REDACTED]
[REDACTED]
9 MR. HILLEGAS: Objection; form.
10 THE WITNESS: [REDACTED]
11 BY MR. STEINTHAL:
12 Q. [REDACTED]
[REDACTED]
[REDACTED]
16 MR. HILLEGAS: Objection; form.
17 THE WITNESS: [REDACTED]
[REDACTED]
19 BY MR. STEINTHAL:
20 Q. [REDACTED]
[REDACTED]
[REDACTED]
24 MR. HILLEGAS: Objection; form.
25 THE WITNESS: I'm not quite sure

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1 what you mean by that.
2 BY MR. STEINTHAL:
3 Q. I'll try it a different way.
4 Ad buying tools can count the number of
5 clicks on the ads that they serve, correct?
6 MR. HILLEGAS: Objection; form.
7 THE WITNESS: To be clear, clicks on
8 an ads are recorded by the Java Script running
9 in a browser. That data then goes back to the
10 sever that served the ad to say what happened to
11 that add, and that data is aggregated, and so
12 it's part of the ad serving infrastructure.
13 It's not part of the ad buying infrastructure.
14 BY MR. STEINTHAL:
15 Q. Are you aware that ad buying tools can
16 include code in the render creatives to allow
17 them to detect when an ad is clicked upon?
18 MR. HILLEGAS: Objection; form.
19 THE WITNESS: I would assume that ad
20 buying tools can select things to say, please
21 tell me when my ad is clicked on.
22 BY MR. STEINTHAL:
23 Q. And --
24 A. But the flow of data is a bit different.
25 Q. Did you investigate whether ad buying

Page 281

1 tools are capable of detecting when their ads
2 are clicked on?
3 MR. HILLEGAS: Objection; form.
4 THE WITNESS: I did not investigate
5 the matrix that ad buying tools report to users
6 to them or the sources of those matrix.
7 BY MR. STEINTHAL:
8 Q. That wasn't my question, but I'll try it
9 a slightly different one.
10 [REDACTED]
[REDACTED]
12 A. [REDACTED]
13 Q. [REDACTED]
[REDACTED]
[REDACTED]
16 MR. HILLEGAS: Objection; form.
17 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
22 BY MR. STEINTHAL:
23 Q. [REDACTED]
[REDACTED]
[REDACTED]

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1 [REDACTED]
[REDACTED]
3 MR. HILLEGAS: Objection to form.
4 BY MR. STEINTHAL:
5 Q. [REDACTED]
[REDACTED]
7 MR. HILLEGAS: Objection; form.
8 THE WITNESS: [REDACTED]
[REDACTED]
10 BY MR. STEINTHAL:
11 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
15 MR. HILLEGAS: Objection to form.
16 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
19 BY MR. STEINTHAL:
20 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
24 A. [REDACTED]
[REDACTED]

Page 283

1 Q. [REDACTED]
[REDACTED]
3 MR. HILLEGAS: Objection; form.
4 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
9 BY MR. STEINTHAL:
10 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
16 MR. HILLEGAS: Objection to form.
17 THE WITNESS: [REDACTED]
[REDACTED]
19 BY MR. STEINTHAL:
20 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Page 284

1 A. [REDACTED]
[REDACTED]
3 Q. [REDACTED]
[REDACTED]
[REDACTED]
6 MR. HILLEGAS: Objection; form.
7 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
10 BY MR. STEINTHAL:
11 Q. [REDACTED]
[REDACTED]
13 MR. HILLEGAS: Objection; form.
14 THE WITNESS: [REDACTED]
[REDACTED]
16 BY MR. STEINTHAL:
17 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
22 MR. HILLEGAS: Objection; form.
23 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]

Page 285

1 [REDACTED]
[REDACTED]
4 BY MR. STEINTHAL:
5 Q. So one last question, I guess. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
11 MR. HILLEGAS: Objection to form.
12 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
19 Q. [REDACTED]
[REDACTED]
[REDACTED]
22 MR. HILLEGAS: Objection to form.
23 MR. STEINTHAL: [REDACTED]
[REDACTED]
25 BY MR. STEINTHAL:

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Page 286

1 Q. [REDACTED]
2 MR. HILLEGAS: Objection; form.
3 THE WITNESS: [REDACTED]
[REDACTED]
5 BY MR. STEINTHAL:
6 Q. Try the question again.
7 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
12 MR. HILLEGAS: Objection; form.
13 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
18 BY MR. STEINTHAL:
19 Q. [REDACTED]
[REDACTED]
[REDACTED]
22 MR. HILLEGAS: Objection; form.
23 THE WITNESS: [REDACTED]
[REDACTED]
25 BY MR. STEINTHAL:

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1 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
5 MR. HILLEGAS: Objection; form.
6 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
9 BY MR. STEINTHAL:
10 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
15 MR. HILLEGAS: Objection; form.
16 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
20 BY MR. STEINTHAL:
21 Q. [REDACTED]
[REDACTED]
23 A. [REDACTED]
[REDACTED]
[REDACTED]

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1 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
7 MR. HILLEGAS: Objection; form.
8 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
17 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
21 MR. STEINTHAL: Why don't we take a
22 few minutes.
23 MR. HILLEGAS: Taking our last
24 break.
25 THE VIDEOGRAPHER: We're going off

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1 the record at 6:02 p.m.
2 (Off-the-record discussion was held.)
3 THE VIDEOGRAPHER: We're going back
4 on the record at 6:19 p.m.
5 BY MR. STEINTHAL:
6 Q. Okay. So we're back on the record, and I
7 just, for the benefit of the reporter and
8 everyone present, identified two exhibits which
9 I'm going to introduce in this round of
10 questioning are subject to the source code
11 protocol under the protective order and
12 designated highly confidential source code. So
13 when we get to them, I will read descriptions of
14 them into the record for the record, and then
15 take the copies back at the end of the
16 deposition according to the order. We're not
17 there just quite yet.
18 MR. HILLEGAS: Well, I'm getting
19 information that the Zoom is muted.
20 BY MR. STEINTHAL:
21 Q. So, Professor, your analysis of Google's
22 information advantage is based on comparison
23 [REDACTED]
24 MR. HILLEGAS: Objection; form.
25 THE WITNESS: My analysis is based

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1 on that, in part.
2 BY MR. STEINTHAL:
3 Q. That is a substantial portion of your
4 analysis [REDACTED]
[REDACTED]
6 MR. HILLEGAS: Objection; form.
7 THE WITNESS: It is definitely a
8 significant part of my report.
9 BY MR. STEINTHAL:
10 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
15 MR. HILLEGAS: Objection; form.
16 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
21 BY MR. STEINTHAL:
22 Q. And you based your conclusion that
23 Google's ad buying tools have an information
24 advantage over non-Google ad buying tools, in
25 part, based on [REDACTED]

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1 [REDACTED]
2 MR. HILLEGAS: Objection; form.
3 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
7 BY MR. STEINTHAL:
8 Q. Is it your opinion that [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
13 MR. HILLEGAS: Objection; form.
14 THE WITNESS: Information advantage
15 is not purely based on number but on the
16 relevance.
17 BY MR. STEINTHAL:
18 Q. Okay. So in that case, why did you cite
19 [REDACTED] in paragraph 33 in your report?
20 MR. HILLEGAS: Objection; form.
21 THE WITNESS: I mention [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] The

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[REDACTED]
[REDACTED]
[REDACTED]
4 BY MR. STEINTHAL:
5 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
9 MR. HILLEGAS: Objection; form.
10 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
16 BY MR. STEINTHAL:
17 Q. Direct your attention to footnotes 23 or
18 24 of your report, which is at the bottom of the
19 page we were just looking at here. Do you see
20 that?
21 A. Yes.
22 Q. Are those the two files that you examined
23 to come to the conclusion that is listed in
24 paragraph 33 -- strike that.
25 Are the two files identified in foot

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1 notes 23 and 24, the files you compared to
2 determine that [REDACTED]
[REDACTED]
[REDACTED]
6 MR. HILLEGAS: Objection; form.
7 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
13 BY MR. STEINTHAL:
14 Q. [REDACTED]
[REDACTED]
[REDACTED]
17 A. [REDACTED]
18 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
22 A. [REDACTED]
23 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

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1 A. [REDACTED]
[REDACTED]
[REDACTED]

4 Q. [REDACTED]
[REDACTED]
[REDACTED]

7 MR. HILLEGAS: Objection; form.
8 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

15 BY MR. STEINTHAL:
16 Q. [REDACTED]
17 MR. HILLEGAS: Objection; form.
18 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]

21 BY MR. STEINTHAL:
22 Q. [REDACTED]
[REDACTED]

24 MR. HILLEGAS: Objection; form.
25 THE WITNESS: [REDACTED]

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1 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

7 BY MR. STEINTHAL:
8 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

13 MR. HILLEGAS: Objection; form.
14 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

20 BY MR. STEINTHAL:
21 Q. [REDACTED]
22 A. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

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1 [REDACTED]
[REDACTED]

3 Q. [REDACTED]
[REDACTED]
[REDACTED]

6 MR. HILLEGAS: Objection; form.
7 THE WITNESS: [REDACTED]
[REDACTED]

9 BY MR. STEINTHAL:
10 Q. [REDACTED]
[REDACTED]

12 MR. HILLEGAS: Objection; form.
13 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

21 BY MR. STEINTHAL:
22 Q. [REDACTED]
[REDACTED]
[REDACTED]

25 MR. HILLEGAS: Objection; form.

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1 THE WITNESS: [REDACTED]
[REDACTED]

3 (Exhibit Number 5 was marked.)
4 "HIGHLY CONFIDENTIAL"
5 BY MR. STEINTHAL:
6 Q. I am handing you a document that has been
7 marked as Somayaji Exhibit 5, which is a
8 printout of the document that is marked, that is
9 referenced in Footnote 24 of your report. And
10 for the record, this document is a printout of a
11 file of a source code file that was made
12 available by Google for the plaintiffs'
13 inspection of the name in which is given in full
14 at to note 24 of professor Somayaji's report,
15 which ends [REDACTED] and the file is
16 designated highly confidential source code under
17 the protective order.
18 MR. HILLEGAS: I'm going to put an
19 objection on this, on the basis this appears to
20 be [REDACTED]
[REDACTED]

22 MR. STEINTHAL: So I will note for
23 the record that we have confirmed that this is,
24 in fact, a copy of it, [REDACTED]
[REDACTED]

75 (Pages 294 - 297)

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1 [REDACTED] but the objection is noted. But we
2 did confirm that this is a printout on the same
3 file that was made available [REDACTED]
[REDACTED].
5 BY MR. STEINTHAL:
6 Q. Do you recognize this, Professor?
7 A. This looks familiar.
8 Q. And as I said, it's a three-page printout
9 containing the file we were just discussing,
10 which you described as [REDACTED]
[REDACTED]
13 MR. HILLEGAS: Objection; form.
14 THE WITNESS: [REDACTED]
[REDACTED]
18 BY MR. STEINTHAL:
19 Q. But if I represent that this is a
20 printout of the file, the same file path that
21 you have looked at.
22 A. If you say so.
23 Q. [REDACTED]
[REDACTED]

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1 [REDACTED]
[REDACTED]
3 MR. HILLEGAS: Objection to form.
4 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
9 Q. [REDACTED]
[REDACTED]
11 MR. HILLEGAS: Objection; form.
12 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
16 BY MR. STEINTHAL:
17 Q. [REDACTED]
[REDACTED]
19 MR. HILLEGAS: Objection.
20 THE WITNESS: [REDACTED]
[REDACTED]
22 BY MR. STEINTHAL:
23 Q. [REDACTED]
[REDACTED]
[REDACTED]

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1 [REDACTED]
2 MR. HILLEGAS: Objection; form.
3 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
13 BY MR. STEINTHAL:
14 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
20 A. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Page 301

1 [REDACTED]
2 Q. [REDACTED]
[REDACTED]
4 A. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
10 Q. [REDACTED]
[REDACTED]
[REDACTED]
13 A. [REDACTED]
14 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
19 MR. HILLEGAS: Objection to form.
20 THE WITNESS: [REDACTED]
21 BY MR. STEINTHAL:
22 Q. [REDACTED]
[REDACTED]
24 A. [REDACTED]
[REDACTED]

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1 [REDACTED]
[REDACTED]
[REDACTED]
4 BY MR. STEINTHAL:
5 Q. [REDACTED]

10 MR. HILLEGAS: Objection; form.

11 THE WITNESS: [REDACTED]

22 [REDACTED]

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1 [REDACTED]
[REDACTED]

3 BY MR. STEINTHAL:

4 Q. [REDACTED]

[REDACTED]

[REDACTED]

9 A. [REDACTED]

17 (Exhibit Number 6 was marked.)

18 (HIGHLY CONFIDENTIAL)

19 BY MR. STEINTHAL:

20 O. So I'm going to hand you -- now I'm

21 handing you a document marked Somavaji

22 Exhibit 6. This is a document --

23 A. Uh-huh.

24 Q. I did not mean to tear that. This is a

25 document that is a change list entry that was

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<p style="text-align: right;">Page 306</p> <p>1 made available to the plaintiffs for inspection</p> <p>2 of the source code protocol, and its number is</p> <p>3 [REDACTED]</p> <p>4 Are you familiar, Professor, with the</p> <p>5 concept of a change list?</p> <p>6 A. I am.</p> <p>7 Q. And did you -- are you aware that certain</p> <p>8 change lists were made available on the source</p> <p>9 code machine for inspection?</p> <p>10 A. I'm aware that they were made available.</p> <p>11 Q. Did you review any Google change list</p> <p>12 inspections as part of your work on this case?</p> <p>13 A. I did not.</p> <p>14 Q. Now, one of the things that's shown on</p> <p>15 the change list entry is generally the specific</p> <p>16 code that was changed in each affected file</p> <p>17 which is known as the diff, correct?</p> <p>18 MR. HILLEGAS: Objection; form.</p> <p>19 THE WITNESS: Yes.</p> <p>20 BY MR. STEINTHAL:</p> <p>21 Q. And in this case, starting on the second</p> <p>22 page on, we have diffs of various files.</p> <p>23 Do you see that?</p> <p>24 A. I do.</p> <p>25 Q. [REDACTED]</p>	<p style="text-align: right;">Page 308</p> <p>1 [REDACTED]</p> <p>2 [REDACTED]</p> <p>3 [REDACTED]?</p> <p>4 MR. HILLEGAS: Objection; form.</p> <p>5 THE WITNESS: [REDACTED]</p> <p>6 [REDACTED]</p> <p>7 [REDACTED]</p> <p>8 [REDACTED]</p> <p>9 BY MR. STEINTHAL:</p> <p>10 Q. [REDACTED]</p> <p>11 [REDACTED]</p> <p>12 [REDACTED]</p> <p>13 [REDACTED]</p> <p>14 MR. HILLEGAS: Objection; form.</p> <p>15 THE WITNESS: [REDACTED]</p> <p>16 [REDACTED]</p> <p>17 [REDACTED]</p> <p>18 [REDACTED]</p> <p>19 [REDACTED]</p> <p>20 BY MR. STEINTHAL:</p> <p>21 Q. [REDACTED]</p> <p>22 [REDACTED]</p> <p>23 [REDACTED]</p> <p>24 [REDACTED]</p> <p>25 A. [REDACTED]</p>
<p style="text-align: right;">Page 307</p> <p>1 [REDACTED]</p> <p>2 [REDACTED]</p> <p>3 [REDACTED]</p> <p>4 [REDACTED]</p> <p>5 [REDACTED]</p> <p>6 [REDACTED]</p> <p>7 [REDACTED]</p> <p>8 [REDACTED]</p> <p>9 A. [REDACTED]</p> <p>10 Q. [REDACTED]</p> <p>11 [REDACTED]</p> <p>12 [REDACTED]</p> <p>13 [REDACTED]</p> <p>14 A. [REDACTED]</p> <p>15 MR. HILLEGAS: Objection; form.</p> <p>16 BY MR. STEINTHAL:</p> <p>17 Q. [REDACTED]</p> <p>18 [REDACTED]</p> <p>19 [REDACTED]</p> <p>20 [REDACTED]</p> <p>21 [REDACTED]</p> <p>22 [REDACTED]</p> <p>23 [REDACTED]</p> <p>24 A. [REDACTED]</p> <p>25 Q. [REDACTED]</p>	<p style="text-align: right;">Page 309</p> <p>1 Q. [REDACTED]</p> <p>2 [REDACTED]</p> <p>3 [REDACTED]</p> <p>4 MR. HILLEGAS: Objection; form.</p> <p>5 BY MR. STEINTHAL:</p> <p>6 Q. [REDACTED]</p> <p>7 A. [REDACTED]</p> <p>8 Q. [REDACTED]</p> <p>9 [REDACTED]</p> <p>10 MR. HILLEGAS: Objection; form.</p> <p>11 THE WITNESS: [REDACTED]</p> <p>12 [REDACTED]</p> <p>13 BY MR. STEINTHAL:</p> <p>14 Q. [REDACTED]</p> <p>15 [REDACTED]</p> <p>16 A. [REDACTED]</p> <p>17 Q. [REDACTED]</p> <p>18 [REDACTED]</p> <p>19 MR. HILLEGAS: Objection; form.</p> <p>20 THE WITNESS: [REDACTED]</p> <p>21 [REDACTED]</p> <p>22 BY MR. STEINTHAL:</p> <p>23 Q. [REDACTED]</p> <p>24 [REDACTED]</p> <p>25 A. [REDACTED]</p>

Page 311

1 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

5 MR. HILLEGAS: Objection; form.
6 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

16 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

20 BY MR. STEINTHAL:
21 Q. [REDACTED]
[REDACTED]

23 A. [REDACTED]
[REDACTED]
[REDACTED]

[illegible]

Page 313

1 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

6 Sorry. I'll try the question again.
7 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

14 MR. HILLEGAS: Objection; form.
15 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

21 BY MR. STEINTHAL:
22 Q. [REDACTED]
[REDACTED]

24 MR. HILLEGAS: Objection; form.
25 THE WITNESS: [REDACTED]

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1 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
10 BY MR. STEINTHAL:
11 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
15 MR. HILLEGAS: Objection; form.
16 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Page 315

1 [REDACTED]
[REDACTED]
3 BY MR. STEINTHAL:
4 Q. [REDACTED]
[REDACTED]
6 MR. HILLEGAS: Objection; form.
7 THE WITNESS: [REDACTED]
[REDACTED]
9 BY MR. STEINTHAL:
10 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
16 BY MR. STEINTHAL:
17 Q. You can put that away. I have a few more
18 questions on topics and we can wrap it up.
19 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
24 MR. HILLEGAS: Objection; form.
25 THE WITNESS: [REDACTED]

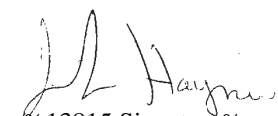
Page 316

1 [REDACTED]
[REDACTED]
[REDACTED]
4 BY MR. STEINTHAL:
5 Q. And one of the consequences that you
6 suggested in your report was that that
7 information advantage made it more difficult for
8 advertisers and publishers to understand the
9 internal operations of Google's auction
10 mechanisms, correct?
11 MR. HILLEGAS: Objection; form.
12 THE WITNESS: My particular
13 assertion has been about the ability of third
14 parties to conduct experiments in order to gain
15 insight into the functioning of the system.
16 BY MR. STEINTHAL:
17 Q. And if hypothetically they were provided
18 with all the same information [REDACTED]
[REDACTED], would they have a
20 greater ability to understand and through -- to
21 perform experiments to understand the internal
22 operation of Google's systems?
23 MR. HILLEGAS: Objection; form.
24 THE WITNESS: As I discuss in my
25 report, the information advantage is in two

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1 parts. Part of it is a difference [REDACTED]
[REDACTED], but
3 there's also the [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
8 BY MR. STEINTHAL:
9 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
13 MR. HILLEGAS: Objection; form.
14 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
17 MR. STEINTHAL: I will designate the
18 transcript as "highly confidential" subject to
19 potentially at last these last portions of
20 source coding portions later, and preserve any
21 time for recross if you have any redirect
22 sessions.
23 MR. HILLEGAS: Why don't we take a
24 break. I have a couple of questions, and then
25 we can probably wrap it up.

HIGHLY CONFIDENTIAL

<p style="text-align: right;">Page 318</p> <p>1 THE VIDEOGRAPHER: We're going off</p> <p>2 the record at 7:01.</p> <p>3 (Brief break was observed.)</p> <p>4 THE VIDEOGRAPHER: We're going back</p> <p>5 on the record at 7:12 p.m.</p> <p>6 BY MR. HILLEGAS:</p> <p>7 Q. Welcome back, Dr. Somayaji. Hopefully we</p> <p>8 will get you off soon. I just have a couple of</p> <p>9 questions for you.</p> <p>10 Does your report rebutting Dr. Milgrom</p> <p>11 contain all of your expert opinions in this</p> <p>12 case?</p> <p>13 A. Yes.</p> <p>14 Q. Do you intend to offer at trial all of</p> <p>15 the opinions that are contained within your</p> <p>16 report rebutting Dr. Milgrom?</p> <p>17 A. Yes.</p> <p>18 MR. STEINTHAL: Objection to form.</p> <p>19 BY MR. HILLEGAS:</p> <p>20 Q. Does anything that you have been shown</p> <p>21 today offer any opinions that you tend to offer</p> <p>22 at trial in this case?</p> <p>23 A. No.</p> <p>24 Q. Does any of the source code that you were</p> <p>25 shown today, change any of the opinions that you</p>	<p style="text-align: right;">Page 320</p> <p>1 REPORTER'S CERTIFICATE</p> <p>2 I certify that the witness in the</p> <p>3 foregoing deposition, was by me duly sworn to</p> <p>4 testify in the within-entitled cause; that the</p> <p>5 said deposition was taken at the time and place</p> <p>6 therein named; that the testimony of said</p> <p>7 witness was reported by me, a Shorthand Reporter</p> <p>8 and Notary Public of the State of Tennessee</p> <p>9 authorized to administer oaths and affirmations,</p> <p>10 and said testimony, pages 8 through 319 was</p> <p>11 thereafter transcribed into typewriting.</p> <p>12 I further certify that I am not counsel</p> <p>13 or attorney for either or any of the parties to</p> <p>14 said deposition, nor in any way interested in</p> <p>15 the outcome of the cause named in said</p> <p>16 deposition.</p> <p>17 IN WITNESS WHEREOF, I have hereunto</p> <p>18 set my hand the 31st Day of October, 2024.</p> <p>19</p> <p>20</p> <p>21</p> <p>22 </p> <p>23 <%13815,Signature%></p> <p>24</p> <p>25 JENNIFER HAYNIE (License No. 403)</p>
<p style="text-align: right;">Page 319</p> <p>1 intend to offer at trial in this case?</p> <p>2 A. No.</p> <p>3 Q. Do any of the hypotheticals posed by</p> <p>4 Google's counsel today, change any opinions that</p> <p>5 you tend to offer at trial in this case?</p> <p>6 A. No.</p> <p>7 MR. HILLEGAS: Pass the way.</p> <p>8 MR. STEINTHAL: No further</p> <p>9 questions. Just for the record, before we go</p> <p>10 off the record, as discussed earlier, I am</p> <p>11 retaining custody of Exhibits 5 and 6,</p> <p>12 Exhibits 1, 2, 3, 4 are held by the reporter.</p> <p>13 Thank you, Dr. Somayaji, for your time.</p> <p>14 THE WITNESS: Thank you.</p> <p>15 THE VIDEOGRAPHER: That concludes</p> <p>16 today's testimony. We are going off the record</p> <p>17 at 7:13.</p> <p>18</p> <p>19 FURTHER THIS DEPONENT SAITH NOT.</p> <p>20</p> <p>21</p> <p>22</p> <p>23</p> <p>24</p> <p>25</p>	<p style="text-align: right;">Page 321</p> <p>1 Errata Sheet</p> <p>2</p> <p>3 ANIL BUNTWAL SOMAYAJI, PHD OCTOBER 30, 2024</p> <p>4 Page No./Line No. Changed from: Changed to:</p> <p>5 --- ---</p> <p>6 --- ---</p> <p>7 --- ---</p> <p>8 --- ---</p> <p>9 --- ---</p> <p>10</p> <p>11 Check if you do not wish to make changes.</p> <p>12</p> <p>13 By signing below, I am confirming that these are</p> <p>14 the only clerical corrections made to my</p> <p>15 testimony.</p> <p>16</p> <p>17 Signature</p> <p>18</p> <p>19 Notary Signature</p> <p>20</p> <p>21</p> <p>22</p> <p>23</p> <p>24</p> <p>25</p>